THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. X. Nº 240—13th YEAR.] LONDON, DECEMBER 31, 1861. [Subscription per Ann. { 15s. in Advance / 18s Credit.] Price 8d. Unstamped.

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RAMSAY'S NEWCASTLE CANNEL has become the principal Cannel Coal used in the Metropolis. Its joint products of gas of high illuminating power, and coke of good quality, make it one of the most economical coals known. The Crystal Palace was lighted from it in 1851, and the Post-office, and *Times* Office, are at present.

FIRE-CLAY RETORTS and PIPES.

FIRE-BRICKS (marked "RAMSAY") OF ALL DESCRIPTIONS.

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THE Directors of the Staleybridge GAS COMPANY are prepared to receive Tenders for Making and Fixing a TELESCOPE GASHOLDER (100 feet diameter), with the necessary Columns, Girders, &c., at their Works, Micklehurst, near Staleybridge.

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The Directors do not bind themselves to accept the lowest, or any Tender.

GEORGE TAYLOR, Clerk.

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Specifications to be seen at the Office of Messrs. FILBY and Co., 63, Fenchurch Street, LONDON, E.C., between the hours of 12 and 2.

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Tenders must be received on or before the 10th day of January next.

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JOSEPH COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL wa awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE CLAY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire Bricks, and every other article in Fire Clay, are promptly executed at their Works as above.

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Coal and Coke Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

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Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanised Tubes, &c.

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FOR SALE, a Telescopic Gasholder, about 53½ ft. diameter, by 24 ft. in depth, having a working capacity of about 50,000 cubic ft.

Also, Two SINGLE-LIFT GASHOLDERS, each above 33 ft. diameter by 18 ft. in depth, and each having a working capacity of about 15,000 cubic feet.

These Gasholders have Guiding and Counterbalancing Apparatus complete, are now at work, and in excellent condition.

Apply to W. ESSON, Engineer, Gas-Works, CHELTENHAM.

Dec. 27, 1861.

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WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the Manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other Articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

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THROUGHOUT ENGLAND, IRELAND, AND SCOTLAND.

Who will assist to circulate a little TRACT, written by a Lamplighter, addressed to his fellow-workmen everywhere, which has been well circulated all over London, and has been the means of doing much good?

Copies may be had for distribution, and will be sent (free), on application to W. J. CATLIN, 8, Drummond Street, Euston Square, LONDON, N.W.

WANTED, GAS-WORKS TO PURCHASE OR LEASE.

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Applications, in the handwriting of the applicant, to be made to A. B., 11, Bolt Court, Fleet Street, LONDON, enclosing Testimonials, and stating wages required.

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H. R. BERKELEY begs to inform the Principals of Gas-Works that, in consequence of the great demand for his IMPROVED PERFORATED METAL NUMBERS for numbering Street Lamps, he is enabled to supply them at half the usual cost.

A sample forwarded on application.

H. R. BERKELEY, Eagle Plate Works, 28, Church Street, Kentish Town, LONDON.

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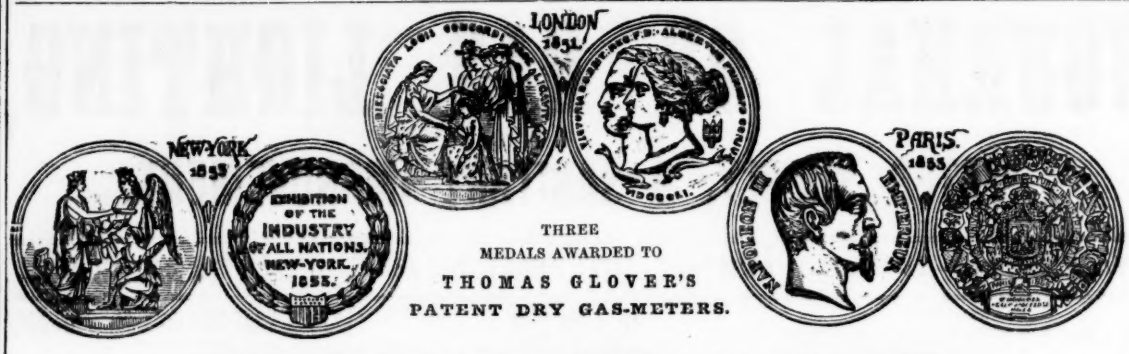
(SUCCESSORS TO GEORGE B. LLOYD & CO.,)
GAS STREET AND BERKLEY STREET,
BIRMINGHAM,
Manufacturers of Wrought-Iron Tubes and Fittings,
FOR GAS, STEAM, AND WATER.
PATENT GLASS ENAMELLED AND GALVANIZED TUBES,
AND
LAP-WELDED IRON BOILER TUBES.

WOLVERHAMPTON RETORT WORKS.
ESTABLISHED 1840.
JOHN EUNSON & SON,
Gas Engineers, and Manufacturers of Clay Retorts
AND FIRE GOODS IN GENERAL,
WOLVERHAMPTON.
Retort Mouthpieces, Bolts, Nuts, and every description of Wrought-Iron Work.

JOURNAL OF GAS LIGHTING ONE PENNY NEWSPAPER



THREE
MEDALS AWARDED TO
THOMAS GLOVER'S
PATENT DRY GAS-METERS.

LORD REDESDALE'S "SALE OF GAS ACT."

DRY METERS *VERSUS* WET METERS.

LONDON, February 25, 1861.

THOMAS GLOVER begs to call the attention of Gas Companies and others to a few *facts*, which, if duly considered, must lead to most important conclusions :—

1. That since THOMAS GLOVER commenced to manufacture his Patent Dry Gas-Meters (which is now upwards of 15 years), every Wet Meter Maker of any importance in England has been compelled to manufacture Dry Gas-Meters; and in the JOURNAL OF GAS LIGHTING, of date of 12th of February, 1861, Messrs. William Parkinson and Co., successors to the late Samuel Crossley, advertise that they "intend manufacturing *Dry* as well as" Wet Meters, and it is worthy of particular notice that they intend to do so "after 40 years experience in manufacturing Wet Gas-Meters of such a quality that has enabled them, as they say, to maintain a superiority over all other; and this, be it also particularly noticed, after they had advertised in the JOURNAL OF GAS LIGHTING, January 29, 1861, "their improved low-spouted Gas-Meter with new patent float arrangement, which entirely overcomes the difficulty experienced by ordinary Wet Meter."

2. That it is quite consistent with THOMAS GLOVER'S knowledge that Wet Gas-Meters, called "low-spouted" or "compensating Wet Meters," have already been proved to be incapable of continuous working or registration, and for this reason the manufacturers of these Meters have been induced to seek the repeal of Lord Redesdale's (righteous) Sale of Gas Act.

3. That every year the Patent Dry Gas-Meter manufactured by THOMAS GLOVER has risen in favour with Gas Companies and Gas Consumers, placing him in the proud position of being the largest manufacturer of Gas-Meters in the country.

THOMAS GLOVER guarantees his Patent Dry Gas-Meters to meet all the requirements of the "Sale of Gas Act," to give accurate and unvarying registration with steady lights; and, from their peculiar construction, cannot be tampered with, and may be fixed in open situations even above or below the level of the lights. They work with less pressure than Wet Meters, and are not affected by the most severe frost.

THOMAS GLOVER guarantees to uphold all Meters sold by him for 5 years free of expense to the purchaser, or for a trifling per centage per annum will contract with any Gas Company to uphold their Meters of his manufacture for a series of years; and, at the conclusion of such contract, to leave the Meters all in perfect working order.

N. B.—Agents in several parts of England are wanted. Apply by letter, or personally.

WILLIAM PARKINSON AND CO.

(SUCCESSORS TO SAMUEL CROSLEY),

PATENT WET AND DRY GAS-METER MANUFACTURERS, &c.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

PATENT IMPROVED WET METER.

W. P. and Co. invite especial attention to this Meter, which entirely overcomes the difficulty to which ordinary Wet Meters are subjected, owing to the short range of the Float, which is necessary, in order to meet the requirements of the Sale of Gas Act.

"It is well known that in Meters constructed so that the valve will close when the water is drawn off to such a point as to render them 3 per cent. slow the lights are liable to be extinguished by the closing of the valve by a sudden increase of pressure. To meet this difficulty, Mr. Pinchbeck has invented an ingenious and simple arrangement by which the action is reversed, and any such increase of pressure, in his Meter, raises the value instead of depressing it. The fact of the improvement having been adopted by Messrs. W. Parkinson and Co. is a sufficient guarantee that it practically and effectually remedies the inconvenience it is designed to meet."—JOURNAL OF GAS LIGHTING.

PATENT IMPROVED DRY METER,

Which W. P. and Co. pledge themselves to manufacture with the same quality of materials and workmanship as in their Wet Meter, thereby giving Gas Companies and others the advantage of procuring a first-rate Dry as well as a Wet Meter, which, hitherto, they have been unable to do.

STATION-METERS AND GOVERNORS,

Which can be seen at all the London Gas-Works. Also Liverpool, Manchester, Sheffield, Nottingham, Belfast, Glasgow, Birmingham, Dublin, Bristol, Leeds, Leicester, Brighton, Southampton, Sunderland, Wolverhampton, Bradford, Norwich, &c., &c.

TEST GASHOLDERS, EXPERIMENTAL METERS, EXHAUSTER REGULATORS,

MINUTE CLOCKS, PRESSURE GAUGES, PHOTOMETERS, PRESSURE REGISTERS, &c.

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NOTICES.

Subscribers who have not paid their subscriptions for the year 1861, or for any previous years, are requested to remit the same forthwith, in the manner indicated below, in order to prevent any interruption in the regular delivery of the JOURNAL; and such subscribers as desire to avail themselves of the reduction in the subscription by paying in advance, must do so in the course of the month of January.

The subscription is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

The next number will be published on Tuesday, January 14, and the subsequent numbers on each successive alternate Tuesday.

Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

This JOURNAL has been duly registered at the General Post Office for transmission abroad.

All Communications to be addressed to the Editor, No. 42, Parliament Street, Westminster; and orders for Advertisements to the Publisher, Mr. W. B. King, No. 11, Bolt Court, Fleet Street.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 31, 1861.

NOTES UPON PASSING EVENTS.

ONE of the military papers informs us that the accident of the return from China of a large quantity of warm clothing very much facilitated the despatch of our troops to Canada. We believe that the clothing of our troops is, at present, in a transition state, and that much remains to be done before the organization is complete. There is something not creditable in the contrast between the "fit" and quality of the cloth of the uniforms of the household troops, and crack cavalry corps, and the Line. By "fit," we do not mean the absurd tightness once patronized by Lord Cardigan, who was trained under the Prince Regent's text—viz., "a wrinkle in a military dress is unpardonable," but the fitting that makes action easy, if not graceful. The surgeon of the City police, Mr. Childs, has made a demonstration as a reformer of uniform on sanitary grounds. He proposes to abolish the hat, and substitute a Greek helmet; to replace the dress-coat by a tunic, protecting the stomach and thighs; to have boots that will not create corns and bunions, and will keep out the wet; and to add military gaiters to the trousers in wet weather. Mr. Childs' language is rather too learned and professional for ordinary readers to understand the full force of his arguments; but, perhaps, it will not, on that account, have less weight with the Court of Aldermen. The expectation that the Volunteers would initiate a reform in military dress has not been realized to the extent that was anticipated. The cavalry continues to be clothed and harnessed in a manner that must terribly hamper both man and horse, when real work has to be done. In France where, in some respects, the troops are as absurdly ornamented as anywhere, the material and cut of the soldier's dress have been very much improved under the present Emperor. In Paris, in the Rue Rochechouart, there is a manufactory where a contractor, under the control of the State, makes the greater part of the clothing for the land and sea forces. Everything is made by machinery, with the exception of the embroidery, joining-seams, button-holes, and sewing on the buttons, which are done by hand. The sewing machines are all worked by women; the ironing for flattening seams, &c., is done by a gigantic "goose," warmed by gas, worked by steam, with a pedal. In the ordinary method, the iron is put in motion, while the article to be ironed remains on the table. In French arrangement, the seam moves while the iron, raised or depressed as occasion may require, remains still. Eighty sewing machines are continually at work in this establishment. We do not know how far sewing machines have been introduced into private establishments in France. In England, their use was for some time seriously retarded by trade rules. The mechanical engineers have more than once been called upon to support strikes, threatened by shoemakers of Northampton and others, against the use of an article it is the special business of mechanics to improve and manufacture. The tailors resisted the introduction of sewing machines very stiffly, and have succeeded in excluding them from some of the best shops in London. But the use of a really useful machine for economizing labour cannot be permanently resisted, and we were amused at hearing the other day of a journeyman tailor applying to his employer for a loan to assist him in purchasing a machine, although he had stoutly joined in resisting the use of them in the public workshop. The master being a far-seeing man, lent the money. Sewing machines have been practically in use in America nearly five and twenty years. They were introduced into Europe with the reaping machine at the great Exhibition of 1851, and there are signs that, when two or three existing patents have run out, and the best parts of each amalgamated, they will be as common as scissor-grinding lathes. A machine strong enough for saddlers' work is still a desideratum. Although the greater number of machines are made in America or on American patents, the town of Redditch maintains its old reputation, and monopolizes the supply of the best machines, as well as hand-needles.

The Australian (Victoria) papers contain an account of a dinner of the Acclimatization Society, which, with the assistance of a French cook, quite throws into the shade such small attempts as Professor Owen's eland banquet. If one of our Royal Princes should ever visit Port Philip, no more delicate compliment could be paid to him than a native and original feast, containing such rarities as the following:—kangaroo, Murray River turtle, and crayfish soup, butterfish, Murray cod, silver fish, golden perch, roast haunch of kangaroo, bandicoot, and wallaby, patties of frogs, paroquet pie, roast wombat, wild turkey, black swan, *supreme* of black duck, curried opossum, jugged kangaroo, roast porcupine, and wattle bird. In the dessert, figured amongst fruits in season:—pineapples, bananas, strawberries, loquats, pears, apples, and oranges.

The present condition of the Australian colony of Victoria, is illustrated by the statistics published in the essays attached to a catalogue of a local exhibition, which has been held in order to prepare and select specimens for our "International Exhibition of 1862." The colony contains 86,831 square miles, of which, not less than 25,000 are more or less auriferous. Of this part, 562 square miles only have been worked, and produced up to the 30th of June last gold of the value of more than ninety-two millions sterling. In twenty-four years (since the foundation of the colony), there have been exported wool, tallow, and hides, to the value of more than twenty millions. The live stock amounts to nearly six million sheep, seven hundred thousand cattle, and seventy

thousand horses. The rateable property within forty municipalities which have been erected is valued at twenty-three millions; and the rateable property within the District Road Boards at five millions sterling. This does not include the mining machinery. Four hundred and twenty thousand acres of land are in cultivation, the average produce of wheat per acre, for the last eleven years, being 22·7 bushels per acre. Ten savings banks contain more than half a million of money, the average deposit of each depositor being a little under £50. The colony raises a revenue of three millions, and receives imports to the value of fifteen millions, in exchange for exports value thirteen millions. The population amounts to half a million including both sexes and all ages. An addition of three millions to the population might take place without increasing its density, beyond what it is at present in the four most populous counties of Victoria. The wages of labour are double the rate prevailing in England: bread is 6d. the 4-pound loaf, and meat from 2d. to 4d. per pound. Nevertheless, distress exists amongst the working classes, distress, which the editor of the *Argus* attributes to intemperance and improvidence. He supports this theory by showing from official documents that this population of five hundred thousand, counting men, women, and children, expends nearly four millions sterling on British and foreign wines and spirits, and beer, besides the consumption of colonial spirits, the beer of forty colonial breweries, and the wine grown on 1100 acres of vineyards. The wines of three colonies used at the beforementioned acclimatization dinner bear the following attractive names: sparkling Victoria, red Cawarra, white Irrawang Malvoisie, Verdeilho, Guapo, Espanoir and Burgundy.

The gold working has been placed in a new position in certain dry districts of Victoria, by the construction of twenty-eight reservoirs, in which about 600 million gallons can be stored for summer use, and supplied to miners at the rate of about 2d. per 1000 gallons. Reef-crushing by machinery is now an established business, and amongst the objects to be sent to the Exhibition of 1862, is a cake of amalgamated gold, weighing 1015 ounces, the produce of three tons of stone from a claim on the Johnson reef, in the Bendigo district. In the elder colony of New South Wales, the gold-fields are less productive than in Victoria, and are likely to diminish still more in value in consequence of the determination of the democracy to exclude the industrious Chinese, who profitably work claims neglected by Europeans. Public reproductive works appear to be carried on with vigour. The New South Wales papers contain notices of harbour works in progress at Wollong-gong and Kiama. The difficulty of securing reliable contractors in these young colonies is shown in a case where the lowest tender for the Kiama harbour works was £115,000. The colonial engineers estimated the cost at £30,000; and, when this exorbitant tender was rejected, the contractor turned back and offered to do the work at the official engineer's price! Of course this "frightful sacrifice" was not accepted. Five thousand pounds are being expended in improving the harbour at Newcastle, the coal port of New South Wales. A wharf, already 1300 feet in length, will be extended to 1740. Works for improving the Clarence river, which traverses one of the finest pastoral districts in Australia, have been designed at an estimated cost of £115,000, and £20,000 have been voted on account, by the Colonial Assembly, or Parliament. The object is to form a good sea entrance—all the rivers in Australia being obstructed by bars. The first vote is to be expended in forming a breakwater a thousand feet in length. The stone is to be obtained from a quarry near the head, and deposited, apparently, after the manner adopted in constructing the Portland Breakwater. Ultimately, this breakwater is to be two thousand feet in length, and another is to be run out from the opposite head. Similar works are contemplated for the improvement of the harbours of the Richmond and Macleary rivers. While the colonies were under the Imperial rule, public works, which could have been so usefully and easily executed by convict labour, were, with few exceptions, neglected. It is satisfactory to find that, in the midst of the continual struggles of factions, the colonial Parliament is authorizing so many permanent and reprodutive undertakings.

It is curious to find all our old abandoned protective fallacies sprouting out again in the colonies. For instance, a railroad proposed by a private company is opposed, because, as one terminus would top the mouth of the river, it might injure the port of Newcastle! Some five and twenty years ago, a military engineer, selected by the Government to arbitrate on a batch of railways between London and Brighton, objected to the best line because it touched Shoreham before reaching Brighton; and might thus, he thought, raise up a rival to the latter. In New South Wales, they are talking of constructing low-speed railways at a cost of £8500 a mile, on a plan proposed by the colonial engineer, Mr. Whitton. If this economical system succeeds in Australia, it will, no doubt, be adopted in India, where the real interests of the country have been thus far sacrificed by the ignorance of the Indian Government, and to the ambition of engineers. It was expected that, before the mails left Sydney, the four capitals of the four colonies of New South Wales, Victoria, South Australia, and Queensland, would be connected by telegraph. We venture again to express a hope that the Australian department of the Exhibition of 1862 will contain a model—a map on a large scale—showing the progress and present condition of all the means of communication. Names of places in the interior convey so little information to European readers, that we refrain from quoting reports on the unfinished railways.

The southern gold-fields of New South Wales show an increase of 43,000 ounces, or 33 per cent., in 1861, over 1860; a decrease on the western of 4673 ounces, or 5 per cent.; and, on the northern of 9407 ounces, or 5 per cent. All the colonies have voted large sums of money for promoting emigration from the United Kingdom, and two have sent expensive lecturers to persuade and convince "a superior class of labourers" and "parties of refined education and small capital," to emigrate. From some knowledge of the present feelings and condition of what were once the emigrating classes, we anticipate very small and unsatisfactory results from these costly lecturing experiments. The English people are rather tired of lectures on almost every subject. The lecturers will find a difficulty in getting an audience to listen to them, and those who come will not be the class wanted in the colonies. A strike of the Newcastle (New South Wales) coal-miners against an attempted reduction of their wages, after lasting two months, has ended in a compromise, which leaves the wages very near the original price, viz., 11s. 4d. for a short day's work. But, it has led to the working of a mine by the men on the co-operative principle; and, if this answers, in competition with companies and private individuals, coal-mining is likely to draw a good many from gold-mining, for 11s. 4d. is considerably beyond the average earnings of a gold-miner. It is thought that the agitation will lead to the working of many new coal-mines in New South Wales.

In the Scotch colony of Otago, in New Zealand, a gold-field has been discovered. Within a period of fifteen weeks, 13,255 persons, including two ship loads of emigrants from Scotland landed at the port Dunedin, the departures during the same period being under 1500; up to the latest accounts, the extent of profitable ground appeared to be limited. The actual amount of gold brought down between July 12th and October 4th, commencing in the former month with 500 ounces, and ending in the latter with 12,000, amounted to upwards of 39,000 ounces. Should these new gold-fields afford permanent employment, that district of New Zealand will obtain what it has long required—a steady market for its agricultural produce.

The *Sydney Morning Herald* contains an account of a plan for extinguishing fires on board ship, devised by the late Dr. Bland of Sydney, which we give in full, in consequence of the importance of the subject, and the deserved reputation of this eminent physician:—

The following are the directions for its use. It may be useful, however, to premise that it applies equally to cellars or other confined spaces, capable of being secured from the free access of atmospheric air:—

"Place on the kelson of the vessel, before it has received its lading, three casks—one for each hold; the upper fifth or sixth of each cask to be pierced with numerous holes, each about an inch in diameter; the rest of the cask to be lined internally with lead. Insert and fasten into the head of each cask, or into the upper part of one of its sides, a metallic tube, about two inches in diameter, to extend as required from the cask to the upper or main deck; the whole length of each tube to be protected with a strong casing of wood.

"To prepare the above apparatus for immediate use, put into each cask *when placed where it is to stand*, a due quantity which will be explained presently, of carbonate of lime—(whiting, chalk, or limestone, or marble broken into small fragments will do)—and should there, at any time, be reason for suspecting the commencement, or the actual existence of combustion, (the hatches having been carefully battened down), pour on the carbonate of lime in that cask which may happen to be nearest the spot where the combustion is supposed to have commenced, by means of the tube attached to it, about one pint of water to each pound of the carbonate contained in the cask, to be followed with 6 ounces, by measure, of strong sulphuric acid, or 8 ounces of nitric acid; or 8 ounces of muriatic acid, poured in slowly, a gill, or less at a time. A disengagement of carbonic acid gas more or less rapid (as the carbonate may be in a state of more or less minute division, and as the acid may be poured upon it more or less

less slowly) would now take place—when the gas escaping, through the perforations in the upper part of the cask, would, by its own weight, and its vast expansive power, force its way along the lower regions of the vessel, until, stratum by stratum, it had expelled and replaced any other gaseous fluid, or had become mixed up with it in those proportions in which it would be destructive of combustion.

"In order to facilitate the mixing of the dilute acid with the carbonate of lime, it would be desirable if whiting or chalk should be used (for creating a more rapid supply of the gas), and the sulphuric acid, for cheapness, to add to the apparatus a second tube, fitted with a strong metallic rod, and furnished at its upper extremity with a transverse handle for rotating it, and at its opposite extremity, which should be immersed in the bottom of the cask amongst the calcareous carbonate, with two or more cross pieces of metal or wood, fixed at right angles with the rod. This part of the apparatus for mixing the ingredients, would be the same as that contrived for a similar purpose in the well-known machine for manufacturing soda-water.

"The quantities of the carbonate of lime and of the acid required for vessels of given tonnage may be deduced from the following statement: 400 lbs. of tolerably pure carbonate of lime, yield about 180 lbs. by weight, or 20,000 cubic feet, or 500 tons by measurement, of carbonic acid gas; and the admixture of about six ounces by measure, of strong sulphuric acid, or eight ounces of muriatic acid of the shops, diluted in about the proportion above specified with water, for the convenience of admixture, is sufficient to neutralize about 1 lb. of any of the calcareous carbonates, while the admixture of carbonic acid gas with atmospheric air, in any proportion not lower than one part of the former to four of the latter will prevent, or extinguish combustion."

The above method of extinguishing combustion was publicly verified, as far as it was possible at the time, by analogous experiment at the Sydney School of Arts in 1839.

A scientific friend suggested to Dr. Bland that it would be much better to substitute marble or limestone in small angular pieces, which would render the stirring apparatus unnecessary, and render the action less violent and more regular.

To these and other suggestions, the doctor observed that respecting the choice of the carbonate to be employed, the calcareous carbonates are, perhaps, the best for the above purpose, as being the cheapest, and not liable to damage on shipboard; and of these the marble or limestone, broken into small angular fragments, would for most purposes be the best. It would, perhaps, be advisable, however, that one of the casks, at least, should be provided with chalk or whiting, against cases of emergency requiring a more rapid disengagement of the gas, and that where there is a choice, one or two of the casks should be placed as originally recommended on the kelson of the vessel, so that advantage may be taken of the expansive power of the gas, for forcing its way with so much certainty and as little delay as possible among a densely stowed wool cargo.

The above means of preventing or of extinguishing fire in the holds of vessels would neither injure the vessel, the cargo, nor the provisions; nor would it, with common prudence, endanger human life. It would, of course, be destructive to any live stock in the hold of the vessel; indeed, so destructive would the gas prove to all animal life within the sphere of its operation, that it might be used, in the manner above described, for the express purpose of destroying rats or insects in vessels, in place of the usual process of fumigation.

Mr. Laird, the eminent iron ship-builder and new M.P. for the new borough of Birkenhead, has, *à propos* of the threatened war with America, reproduced his plan for turning all the Mersey tug and ferry-boats into gun-boats, by certain simple, inexpensive additions and alterations. His letter to the *Times* has brought out an equally valuable suggestion from another Liverpool man—a Mr. Thompson—viz., to replace by degrees all our floating light-ships by iron ships, which shall be batteries armed, connected with the land defences by submarine cables. These two suggestions are very important taken in connexion with our Naval Reserve, Naval Volunteers, and Volunteer Artillery.

Professor Anderson has lately delivered a lecture before the Highland Society, on the value of certain substances, which are not themselves food, in increasing the nutritive value of food for the live stock of the farm—that is to say, of substances which, by "maintaining the general functions in a state of health, or by promoting digestion, facilitate the assimilation of food." The subject assumed importance, in consequence of the pertinacity and audacity of the cattle-food quacks, whose advertisements meet you at every turn, placarded on every wall, or showered upon you in pamphlets, in gratuitous newspapers, and gratuitous almanacs, edited with a sort of electrotyping of science. In the show-yard of the Royal Agricultural Society at Leeds, to the paper and almanac nuisance, was added the bawling of a red-faced, not very sober showman, whose proper place would have been in the travelling van, behind a big drum, of some charlatan in a cocked hat and gorgeous uniform. The cattle-food advertisers offer for sale, at enormous prices, varying from £16 to £40 per ton, what they call *condimental* food. It is the name on which they found their claim to a price so far beyond the cost of the best hay, corn, lentils, and cake. These quack cattle stuffs were originally called "*concentrated foods*," a term clearly borrowed from that used in describing manures, and intended to lead to the belief that the nutritive matters of the food of animals had been concentrated in them in a manner similar to that in which the nutritive elements of the plant food are found concentrated in guano or superphosphate." This view is specious, attractive, and fallacious. A manure can be concentrated, because it contains many substances of little or no use to the plants. Thus, although it would not be economical, it would be practicable to concentrate four tons of farm-yard manure into one. A plant is able to take its food in the form of simple compounds, such as ammonia, carbonic acid, &c.; but animals possess no such power. Their food must be supplied to them in the complex and bulky compounds which the plant alone can produce. Practically, it is impossible to concentrate the food of animals, because there are no processes known by which the innutritious matter can be removed in such a manner as to leave nutritious substances in a state in which they can be used as food. In the grains of cereals the only absolutely innutritious substances are water and a small quantity of woody fibre; the latter cannot be destroyed without entirely destroying the grain. The former, if repelled by heat, would be immediately reabsorbed from the air. Those manufacturers of artificial cattle food who have called in the assistance of chemical testimonial makers have, no doubt under sound advice, substituted the word "condimental" for "concentrated." A minute examination of a number of these cattle foods recently made in his laboratory, by Professor Andersen, showed that these mixtures sometimes contain as much woody fibre and water as any other vegetable substances consumed by cattle; and, that they are, in fact, mixtures of the most ordinary materials, consisting of Indian corn, rice, bean-meal, carrot, beans ground, and other similar substances, with small quantities of aromatic seeds, and in nine instances a bitter substance, apparently gentian. The professor says:—

It is absurd to suppose that the contents of a small tin measure, holding about half a pint of these substances, can be used to replace one-half of the ordinary food of an ox or a horse; and their inventors, seeing that, as soon as these facts become known to the farmer, their position would become untenable, have taken refuge behind the aromatics and bitters they contain, and have asserted that their effect is condimental, and that they act by promoting digestion, and causing the animal to extract and assimilate a larger quantity of the nutritive matters of its ordinary food. . . . There is, in fact, not the slightest reason to suppose that the substances contained in these foods have any such effect. They consist, in addition to the grains already mentioned, chiefly of fecungree and carraway seeds, and one of those examined contained so large a quantity of turmeric, that it might almost be described as a curry powder. . . . In fact, when a dispassionate view of the matter is taken, I think it can scarcely be doubted that, if small quantities of carraway, or other aromatic seeds, were given to animals, and their weight, carefully determined, it would be found that they are quite without effect. It must be noticed that there have been no attempts, on the part of the "discoverers," to produce such accurate experiments in support of their views although there have been plenty of general testimonials, such as every quack medicine can produce by the score, and abundance of vague declamation regarding their wonderful effects. . . . But, even admitting the accuracy of all the statements put forth by the makers of their food, there is another question which merits attention, and that is—the price at which they are sold. They are composed chiefly of some of the more familiar foods mixed with a small quantity of aromatics. The exact proportion in which these latter substances exist in them, cannot be accurately determined; but it is not large, and does not generally exceed 10 per cent. Indian corn, carob beans, &c., cost about £8 or £9 per ton, and fecungreo and carraway seeds, about £20 to £25. A mixture of nine tons of the former, and one of the latter, should, therefore, be sold at £10 or £11 per ton, in place of £20 or £30, the price actually charged; so that, now, if these goods do produce the alleged effect, the farmer is made to pay for them three times their intrinsic value. This fact is, of itself, a sufficient comment on what has been already stated; and the truth is, that the "discoveries" of which the makers of these foods boast, are confined to the art of extracting money from the pockets of the farmer. The general conclusions to be drawn from careful experiments, may be summed up in a very few words:—1st. Common salt, the most important condiment, has no effect in promoting the assimilation of the food, and, when used in *larger* quantity, has rather a tendency to produce a waste of nutritive matters; 2nd. Both it and phosphate of lime, and probably other mineral substances, may exercise a beneficial effect on its health, when the quantity existing in the food is less than the animal requires; 3rd. There is not the slightest reason to suppose that the so-called condimental foods produce any effect in the animal, as they consist only of ordinary grains, mixed with small quantities of aromatic and bitter substances, which, so far as our present knowledge goes, do not, in any way, affect the nutrition of animals.

The experiments as to the use of salt in feeding cattle, show that in some kinds of natural food there is a sufficient quantity of salt; in others, not enough; for instance, meadow hay contains 2940 grains of salt in 100 lbs.; oats, only 210 grains. Now, as a horse excretes daily about 20 lbs. of urine, containing nearly 400 grains of salt, it may be advantageous when fed, as racehorses and omnibus horses are almost entirely, on oats and beans, to give them a lump of rock-salt to lick. This is the common sense of a question which advertising profits scarcely permit even the most virtuous agricultural newspapers to treat as freely and prominently as the importance of the subject demands. These condimental foods have only one merit, where expense is not an objection. They will sometimes tempt a sick or convalescent animal to eat. But, a person who has more than one animal to feed, can manufacture the article at about £12 per ton himself.

Circular to Gas Companies.

We are glad to be able, at the close of another year, to congratulate the gas companies of the United Kingdom on the general increase in the value of their property during that period, and on the prospect of the continuance of their present prosperous condition in the new year. This state of prosperity is partly due to the continued low price of coal, and freights, and still more to the rapidly-extending consumption of gas in private dwellings, for every year witnesses the diminution of the prejudice against the burning of gas, as the advantages of gas lighting become more known and appreciated. The complete failure of the gas agitation in the metropolis has also, no doubt, tended to increase the value of gas property, not in London only, but in all parts of the country, by discouraging attempts at similar agitations in the provinces. The schemes for the introduction of other modes of illumination as substitutes for coal-gas, which have at various times depreciated the value of gas shares, appear to have been all abandoned, and there seem no clouds in the horizon of the coming year that are likely to obscure the bright and brightening prospect.

The squabble between the Great Central Company and the Commissioners of Sewers of the City of London is probably the only gas dispute that will ripen into a parliamentary contest during the next session. Nor will the Bill promoted by the Commissioners of Sewers afford much scope for discussion, for its object is limited to excepting the City of London from the operation of the Metropolis Gas Act of 1860. Thus, after the very formidable and comprehensive notice which was given of their intention to apply to Parliament for an amendment of the principal provisions of that Act, the commissioners have had the laudable discretion to abandon such Quixotic intentions; and the preamble of the Bill, after setting forth the circumstances under which the City of London was supplied with gas before and subsequently to the formation of the Great Central Company; and the conditions on which that company obtained their Act, merely states that "it is expedient that the Metropolis Gas Act, 1860, should be amended, by excepting the City of London and the Liberties thereof, and the Great Central Gas Company and other companies supplying gas within the said City and the Liberties thereof." There are two enacting clauses, to carry into effect the object stated in the preamble, by the first of which it is provided that the Metropolis Gas Act shall not apply to the City; and, by the second, it is provided that the Acts of the gas companies in the City of London are to take effect as if the Metropolis Gas Act had not been passed. As it is against the Great Central Company that the attack is directed, the Commissioners might have accomplished their object more easily by a Bill containing a single clause, striking out the name of that company from the preamble of the Act of 1860. But, after the blustering oratory of the agitators in the meetings of the commissioners, such a simple result would have appeared like a mountain in labour to bring forth a mouse; therefore, a correspondingly blustering notice was given of what they would do in Parliament, and the adoption of the simple proposition was not in conformity with the terms of that notice. The Bill of which the Great Central Company are the promoters, is still shorter than that of the Commissioners. Its object is stated to be to remove the doubts that have been advanced by the authorities of the City of London, whether the company can raise the price of gas, consistently with their original Act, which fixed the maximum price at 4s. per 1000 feet; and it seeks, by a single enacting clause, to empower the company to raise the price, subject to the provisions and restrictions of the Metropolis Gas Act, "anything in the Great Central Gas Consumers Act, 1851, to the contrary notwithstanding." It is not certain that the Standing Orders Committee of the House of Commons will allow the Great Central Company's Bill to proceed, as the notice of their intention to apply for it was not given within the prescribed time; nor would it be necessary, should the Court of Queen's Bench, before which the case will be brought in the course of next month, decide that the Metropolis Gas Act overrides the Great Central Company's Act of 1851. In the event of such a decision, the commissioners would, of course, be most anxious to proceed with their Bill, but it is so directly opposed to the principle of recent gas legislation, and it would be so unjust to the other companies which supply the City of London with gas, that we cannot conceive it would be favourably received, even were Parliament not sickened with the question of metropolis gas supply. In most of the gas Acts recently passed, the quality and illuminating power of the gas have been raised, and, it is not probable, that that principle would be so far departed from in regulating the gas supply of the City of London, as to pass a Bill which has for its object, to diminish the illuminating power of the gas below the standard in other parts of the metropolis. It is generally admitted that the minimum illuminating power prescribed by the Metropolis Gas Act is, at least, 14 per cent. higher than that prescribed by the Great Central Company's Act, for which additional amount of light the company demand an advance of 12 per cent. in price; and the supply of a better article, for a proportionately less price, is not such a grievance as is likely to induce the interference of the Legislature. The exception of the City from the operation of the Metropolis Gas Act would be, at the same time, an act of great injustice to the Chartered Company, who supply the City as well as other districts of the metropolis; that company would, in order to retain their customers in the City, be compelled to supply gas on the same terms as the Great Central, while they would be compelled, under the provisions of the Metropolis Gas Act, to maintain the illuminating quality of their gas at a much higher standard.

The *City Press*, which is the organ of the agitators among the Commissioners of Sewers, continues to publish misrepresentations of the conduct of the Great Central Company, with a view to keep up the excitement. The charge of breach of faith to the consumers seems to have been abandoned since the publication of Mr. Dakin's able reply, and the question is now resolved into a commercial one; it being contended that there is no justice or reason in charging the consumers of gas a higher price because the company have been mismanaged and experienced losses. Viewed as a commercial question, however, the gas consumers have no right to complain; for, setting aside the advantages they have gained during the last ten years, by being supplied with gas for 4s. per 1000 feet, it is now proposed to give them a better quality of gas for a proportionably less price, and to continue to supply meters rent free. The spirit which animates the majority of the Commissioners of Sewers was clearly shown at the recent meeting of the court to receive tenders for lighting the public lamps for one year from the 1st of February next. The Great Central Company, who now supply the public lamps by batswing burners, consuming five feet per hour, for £4. 10s. each, tendered to continue the supply at the same charge with the improved quality of gas required by the Metropolis Gas Act. The City Gas Company tendered to supply the same quantity and quality of gas for £5. 5s. each lamp, and this tender, which was 15s. per lamp higher than that of the Great Central Company, was accepted. The commissioners have thus gratified their spleen against the company at a cost to the ratepayers of about £1275 per annum, and that advance having been once obtained, it is not probable that the old price will be again accepted. It will be well for the ratepayers, if the further indulgence of the same spirit does not cost them a much larger sum for Parliamentary expenses in promoting a Bill which, even should it pass, could produce no practical advantage.

Only six other gas Bills have been lodged at the parliamentary office, in addition to the two relating to the City of London. The first of these, in alphabetical order, is a Bill for paving, lighting, and improving the township of Bollington, in the parish of Prestbury, in Cheshire. The object of the Bill is to empower the local board to construct gas-works, and to do other necessary acts for lighting the township with gas. The board are to be authorized to borrow for that purpose the sum of £20,000, and to levy a lighting-rate not exceeding one shilling in the pound. The maximum price of gas is fixed at 6s. per 1000 feet, and the illuminating power is to be 18 sperm candles.

The Heckmondwike Gas Company apply to Parliament to be incorporated, and for power to sell their works to the local board. The capital of the company is to consist of the original £7000, with power to raise additional capital by the creation

of new shares to the amount of £9500, on which new capital the dividend is to be limited to 7½ per cent. Power is also to be granted to borrow £2000 on the old capital, and £3000 on the new capital. The maximum price for 12-sperm-candle gas is to be 5s. per 1000 feet. The company are to be empowered at any time to sell their undertaking to the local board, with the consent of three-fifths of the shareholders, for such price as may be agreed upon.

The Leeds New Gas Company apply for power to raise additional capital, and to extend their limits for supplying gas to the adjoining township of Roundhay. The additional capital, to be raised by the creation of new shares, is to amount to £65,000, with power to borrow one-third the amount. The present share capital of the company is £130,000.

The Stretford Gas Company, in the parish of Manchester, apply for an Act of Incorporation, and for power to raise additional capital. The present nominal capital of the company is £15,000, a portion of which, however, has not been paid up; and it is sought to raise the capital to £39,000. The maximum price is to be 6s. per 1000 feet for 14-sperm-candle gas.

The fifth Bill is for the incorporation of a company for lighting the Windermere district with gas, including the townships of Undermillbeck, Applethwaite, and Troutbeck. The amount of capital named is only £10,000. The quality of the gas is to be 12 sperm candles, for which a maximum price of 8s. per 1000 feet is named.

The object of the last Bill in the list is to empower the Woolwich Consumers Gas Company to increase their present share capital of £24,000 by the issue of new shares to an equal amount, so as to raise the share capital of the company to £48,000, and with power to borrow any additional sum not exceeding £6000.

It is with much regret that we announce that the gas companies at Reading have ignominiously succumbed to the local board, and, in consideration of the withdrawal of the threatened opposition to the Bill for the amalgamation of the two companies, a compromise has been agreed to, by which the interests of the shareholders have been sacrificed, and a precedent has been established, which will be referred to as an example of the effect of the threat of opposition on the part of local authorities in extorting from gas companies the terms required, however unjust. The directors, in thus yielding to the threats of the local board, have not only sacrificed the interests of their shareholders, but they have inflicted an injury on all gas companies throughout the provinces that may be brought into collision with the local authorities. It would have been much better to have granted what was demanded at once, than to have offered an exasperating resistance, which ended in their deserting their friends, and the principles for which they had so pugnaciously contended.

At Wakefield, a different result has attended the threatened collision between the Town Council and the gas company. The project of establishing a rival company has, for the present, been abandoned, and a truce has been agreed upon between the belligerents, which may be considered as a temporary triumph, at least, to the gas company.

We published, in the preceding number of the JOURNAL OF GAS LIGHTING, the estimates adopted by the Metropolitan Board of Works for the erection and fittings of four district establishments, or rather palaces, for the testing and stamping of meters. The expenditure of £15,000 for such a purpose is a waste of the ratepayers money that ought not to be submitted to without strong remonstrance. This extravagance seems the more outrageous when contrasted with the economical and very efficient arrangements made by the City justices, who have, at the cost of about £1500, provided a most efficient establishment that might serve for testing half the meters manufactured in London. The complete arrangements for carrying the Sale of Gas Act into operation in Edinburgh may also be contrasted with those of the Metropolitan Board to the great disparagement of the latter. Notwithstanding the extravagant outlay of money, the convenience of the meter-makers, of the gas companies, and of the public, will be very inadequately provided for in the metropolis, with only four district offices to which meters may be sent. In Edinburgh, nine inspectors have been appointed by the magistrates, in separate districts, and these inspectors, with one gasholder each, are not more than sufficient to meet the demands of the public, and of the manufacturers for stamped meters. In one respect, however, the magistrates of Edinburgh have not complied with the Act, the 4th section of which directs that there shall be "such variations of numbers or marks on the stamps as shall be sufficient to distinguish each inspector's district." In violation of this provision, the stamps used by each one of the nine inspectors has the same number (11) as the original stamp obtained from the Exchequer Office for the city of Edinburgh. This irregularity should be corrected without delay.

We have always given Mr. Flintoff credit for the possession of an unusual amount of assurance, but we were not prepared for such an outrageous display of that quality as he has recently exhibited. The exposures that have been made of the effects of his gas engineering at Sheffield had evidently annoyed him; and we thought that, of all towns in the kingdom, Sheffield would have been the last place where he would have ventured to show himself. But we underrated his courage, for he has had the hardihood to reappear at Sheffield, at the invitation of the gas-fitters, "to show how consumers MAY REGULATE their meters, avoid the glaring impositions of the gas companies, and secure gas of improved quality at a lower price." The words marked emphatically in the foregoing quotation are so printed in the handbills announcing the meeting, and clearly indicate his intention to teach the consumers of gas how to "regulate" their meters, so that they may register a smaller quantity than they do at present. He showed his audience that, by taking out the screws at the side, top, and bottom of their meters, after they had been regulated by the gas company's officers, the quantity of water might be reduced until the instruments became "honest meters," that would not register against the consumers. If such practices conform to Mr. Flintoff's notions of honesty, his morality is not of a higher standard than his skill as a gas engineer, and we trust that none of his auditors would be guided by his precepts. The audience were, indeed, but few, for notwithstanding great efforts were made to give *éclat* to Mr. Flintoff's presence in Sheffield, which was announced from a van drawn through the town with a band of music, the attendance at the lecture is stated by the local paper to have been "meagre." This was attributed to a charge of threepence having been made for admission; therefore, on the next occasion, the doors were thrown open without charge; but, nevertheless, the people of Sheffield took so little interest about Mr. Flintoff and his method of doctoring meters, that we are informed, "the attendance was again meagre." Mr. Flintoff's statements are generally so untrustworthy that it is almost unnecessary to correct them, but his representations respecting the Sheffield Gas Company contain some fallacies that it may be as well to notice, in case weight should be attached to them in any quarter. He stated that in 1851, the company, when charging 5s. per 1000 feet, paid only 8⅓ per cent. dividend on a capital of £139,000; and that now, with gas reduced to 3s. 9d. per 1000 feet, they pay 10 per cent. on £302,000, thus proving that he was right in advocating a reduction in the price of gas. He was very wrong, however, in his statement of the figures, for the company now pay 10 per cent. on only £135,000, and 8 per cent. on £91,000, making together £226,000, and not £302,000 as he misrepresented. If the present company had not been required to pay £40,000 to Mr. Flintoff's company for works which were worthless, the price of gas at Sheffield would most probably be now less than it is. It suited Mr. Flintoff's purpose to be highly laudative of the meter inspector of Sheffield; but, that officer, we imagine, would not feel much flattered by Mr. Flintoff's laudation. The gas-fitters, at whose instigation he now reappears at Sheffield, are actively canvassing for the sale of meters; and, one of the objects of Mr. Flintoff's mission, is to dissatisfy the consumers with the meters supplied by the gas company. Hitherto, his efforts have been of little avail. The company are doing their utmost to comply with all the demands upon them for stamped meters, and those obtained from other sources have been comparatively very few.

As we propose reprinting in our next number the Quarterly Share-List of Gas and Water Companies, we shall be obliged by our readers pointing out any change which may have taken place in the paid-up capital, dividends, or value of shares since the publication of the last list, on the 27th of August last, of which we have not been already advised.

Communicated Article.

OBSERVATIONS ON SOME IMPORTANT DEFECTS IN THE WATER-WORKS CLAUSES ACT, 1847.

The clauses of the Water-Works Clauses Act, "with respect to the waste or misuse of the waters supplied by the undertakers," are limited in their application to those undertakers whose special Acts provide "that the water to be supplied need not be constantly laid on under pressure;" in other words, to the exceptional case of undertakers who, by their Acts, are specially excepted from the one obligation upon which the Legislature most commonly insists.

Moreover, provisions for the prevention of the waste and misuse of water are, obviously, much more necessary when the water is being *constantly* supplied, than when the water is supplied only intermittently and for, perhaps, not more than one hour per day; in the one case, the loss from similar causes will be at least twenty-four times as much as in the other case. Hence it has happened that several water companies, established on the otherwise beneficial system of "constant supply," have been commercially ruined, whilst nearly all the companies established on this system, and not protected by legislative enactments for the prevention of waste and misuse, have been seriously injured. In the case of the Norwich Water Company, adduced as a single instance from many similar ones, the consumption, waste, and misuse attained to 40 gallons per head per diem and exhausted all the resources of the company; but, since the introduction of legislative provisions for the prevention of waste and misuse, the consumption has become reduced to 15 gallons per head per day, the water being still constantly supplied under pressure, and its proper use being in no wise limited or restricted. It may also be pertinently observed that local boards of health, not acting under the Water Clauses Act, have very generally abandoned the system of constant supply, on account of their inability to cope with the excessive waste incident, not to the system itself, but to its abuse. The imperfect apparatus supplied by common plumbers and small builders to water-closets, soil-pans and cisterns, are amongst the chief causes of excessive waste. In the city of Oxford, the delivery of water amounts to the enormous quantity of 110 gallons per head per day, of which at least 90 gallons are wasted through imperfect apparatus and improper domestic arrangements.

The clauses of the Water-Works Clauses Act, are also extremely defective and confused in many other important particulars, and, consequently, the local justices and the higher tribunals are equally unable to convict wrong-doers, or to afford any effective relief to the suppliers of the water. Amongst other important instances of unhappy legislation, the conflict of enactments relating to the recovery of rates may be referred to. In the very common case of the undertakers affording a supply of water to the occupier of a tenement let at a rent not exceeding £10 per annum, *otherwise than upon the "request" of the owner*, which "request" is rarely obtainable, the undertakers are held to be incapable of recovering the amount of the water-rent from either the owner or the occupier; for, by the 72nd section of that Act the owner alone is made liable for the amount of the water-rent due in respect of the supply of water to such tenements, while by the 44th section his liability does not attach unless he has himself *requested* the pipe to be laid on, or the pipe has been laid on "upon the request of the occupier with the *consent in writing* of the owner." At Sunderland, where, notwithstanding the owner's refusal or neglect to "request" or "consent," the water company has extensively supplied at the request of the occupiers the cottage and tenemented property inhabited by the poorer classes, the justices have (no doubt, properly) held that the company could not recover the water-rent from either the landlord or his tenant. The results of this defect in the existing legislation are—

1. To occasion to the water suppliers the loss of a considerable portion of the rental arising from the supply of the poorer classes;
2. To indispose the water suppliers to afford supplies of water to the poorer classes in the numerous cases in which the owners neglect, or refuse to make the neccessary "request," or to give the necessary "consent in writing."

Again, by the 35th section of the Water-Works Clauses Act, a condition precedent to the company becoming entitled to collect its rates is expressed in the following terms: "And such water [*i.e.*, the water supplied by the undertakers] shall be constantly laid on at such a pressure, as will make the water reach to the top story of the highest houses within the said limits, [*i.e.*, the limits of the special Act] unless it be provided by the Special Act, that the water to be supplied by the undertakers need not be constantly laid on under pressure." Now, it very rarely happens, that the area within the limits of the special Act does not contain hills or other sites elevated above the source or means of supply (whether the same be natural or artificial), and which are either already, or are likely to become subsequently, occupied by dwelling-houses. Moreover, in other instances, "the *top* stories of the *highest* houses" situated on the summits of even inferior elevations, can rarely be reached by a *constant* supply. And lastly, the "loss of head" occasioned by the friction of the water in its passage to the remote points of an extensive district, is generally so considerable during the mid-day hours, as to prevent the reasonable practicability of a *constant* supply to the *top* stories of houses thus remotely situated. These physical conditions over which the undertakers have either no control, or only a very imperfect and limited control, necessitate the insertion into nearly all special Acts in which the Water-Works Clauses Act is incorporated, of a clause to modify the 35th section of the latter Act.

Moreover, in many parts of the Water-Works Clauses Act, and in numerous special Acts, the words "rate" and water-rate" are carelessly used to express the money charge to be made by the undertakers for the water supplied to the consumer; but, the legal meaning of the word "rate" is a compulsory assessment or tax, made and levied for the relief of the poor, or for some other object or purpose burdensome to, and obligatory upon, a community to the individuals composing which no separate benefit arises. In the instance of a supply of water voluntarily taken by as many as please, the charge is manifestly in the nature of an account rendered for goods sold and delivered, and not of a "rate" or tax. Nevertheless, in some important cases, the courts have held that, by the unmodified use of the word "rate," they are compelled to deal with charges for water consumed in exactly the same fashion in which they would deal with a poor-rate, and have accordingly proceeded to quash the whole of the so-called rate, on the ground of some technical irregularity or partial inequality. The water-charges levied in Liverpool on certain classes of voluntary consumers were thus recently dealt with by the Court of Queen's Bench, and the infliction of a great practical injustice was the result.

Attention may also be drawn to a defect in the private bill legislation of recent years. It is now usual to enact that the rates and charges of water companies "may be recovered in *any* court of *competent jurisdiction*," with the intention (obviously) of facilitating the recovery of the companies claims in the county court, or through the intervention of any other cheap and speedy local tribunal. But the judges of the county courts have repeatedly held that, by these vague and general words, no jurisdiction is given to them, inasmuch as by the Water-Works Clauses Act, section 74, a particular mode of recovery and a particular tribunal are prescribed, and that, in consequence of this particularity, the specified process of the specified tribunal must, in the absence of a *precise* enactment to the contrary, be in all cases adopted, for that, in point of law, the so-*specified* tribunal is alone made "*competent*" to hear and decide and enforce its judgments.

With a view to provide a sufficient remedy for the foregoing (only some amongst many other) defects in the Water-Works Clauses Act, the following draft-clauses, or any improvements upon them, are suggested to be inserted in all the water-works bills of the coming session. These suggested clauses have no claim to originality, except in so far only as that they combine together the best and most useful of the provisions contained in several water-works Acts recently passed by the Legislature, and add some amendments which an extensive experience in the practical application of these provisions has shown to be essentially necessary to render them effectually operative.

In conclusion, it may be remarked, that the undertakers of water-works are placed in a widely different position, in respect to the parties with whom they deal, to the undertakers of any other work established for the benefit of the public. In all cases, except in the case of water-works, the property of the undertakers either remains constantly under its own purview, management, and control, or its possession is not parted with till the quantity, extent, and value of the article delivered, or of the accommodation afforded, has been accurately ascertained. In the most analogous instance of gas-works, the company does not part with the gas till the quantity delivered has been ascertained by the instrumental admeasurement of an ever-present domestic meter. But, in the case of the undertakers of water-works, the Legislature imposes not only the obligation of a constant supply, but also requires that such constant supply shall be afforded to an indefined and unlimited amount for a defined and limited annual remuneration, based, not upon the supposition of the existence of improvident use or continuous waste, but upon the very mistaken expectation that builders, plumbers, house speculators, rent-agents, household servants, and the public generally, will spontaneously bestow the care, pains, and attention necessary to conserve the water of the undertakers under circumstances in which, as commonly happens, its misuse or waste is attended, not only with no kind of inconvenience or expense to themselves, but sometimes, as in the instance of foul and neglected drainage, with a positive but nevertheless very improper and wrongful advantage.

The Water-Works Clauses Act was framed at the moment when the public and legislative mind became, for the first time, fully awakened to the necessity of sanitary improvements; but, unfortunately, its principal enactments were suggested in ignorance or disbelief of those practical conditions by which every physical operation is necessarily restricted. An unlimited quantity of water cannot be delivered from a limited source, nor be stored in a reservoir of limited capacity, nor be purified in filtering-beds of limited magnitude, nor be raised by engines of limited power, nor be transmitted through pipes of limited size, nor be elevated to exceptional heights; in all these respects, every water-work under-

taking is necessarily controlled either by natural, legislative, or monetary conditions; but, nevertheless, for the operation and consequences of these practical and inevitable limitations, the Water-Works Clauses Act makes no provision of any kind.

SUGGESTED CLAUSES.

Regulations for Preventing Waste, &c., of Water.

A.—For the purpose of preventing the waste, misuse, or undue consumption or contamination of the company's water, the company may, from time to time, make such rules and regulations as they may think necessary to be observed by the persons supplied with the company's water, and may thereby direct the use and prescribe the size, nature, strength, and materials, and the mode of arrangement, alteration, and repair of the pipes, valves, cocks, cisterns, baths, soil-pans, water-closets, and other apparatus or receptacles, or any of them, to be used by such persons respectively, for conveying, delivering, and receiving such water, and may thereby interdict any arrangement, and the use of any pipes, valves, cocks, cisterns, baths, soil-pans, water-closets, and other apparatus, and receptacles, which in their judgment will be likely to occasion any such waste, misuse, undue consumption or contamination; and shall not be bound to supply or continue to supply water to any such person, unless such rules and regulations be and continue to be duly observed by him; and the pipes, valves, cocks, cisterns, baths, soil-pans, water-closets, and other apparatus and receptacles used or to be used, shall be made of such size, nature, strength, and materials, and shall be so arranged, kept, and repaired, as the company shall, from time to time, so prescribe or otherwise approve. And in case of the neglect or refusal of any such person to observe such rules and regulations or any of them, the company may, after twenty-four hours notice in writing, and by or under the direction of their duly authorized officer, repair, replace, or alter, or cause to be repaired, replaced, or altered, any pipe, valve, cock, cistern, bath, soil-pan, water-closet, or other apparatus, or receptacle of any person supplied by them; and the expenses of every such repair, replacement, or alteration shall be repaid to the company by the person on whose credit the water is supplied, and may be recovered by them as damages for the recovery of which no special provision is made.

Penalty for Waste, &c., of Water, by non-repair of Pipes, &c.

B.—If any person supplied with water by the company shall wrongfully cause or suffer any pipe, valve, cock, cistern, bath, soil-pan, water-closet, or other apparatus or receptacle to be out of repair, or to be so used or contrived, as that the water supplied to him by the company is or is likely to be wasted, misused, unduly consumed or contaminated, or as to occasion or allow the return of foul air or other noisome or impure matter into any pipe belonging to or connected with the pipes of the company, such person shall for every such offence forfeit to the company not exceeding five pounds, and shall forthwith remove, replace, or alter, or permit to be removed, replaced, or altered, any such pipe, valve, cock, cistern, bath, soil-pan, water-closet, or other apparatus or receptacle to the satisfaction of the company or its duly authorized officer.

Power to Company to Let for Hire Meters.

C.—The company may let for hire to any consumer of the water supplied by the company, any meter or instrument for measuring the quantity of water consumed and supplied, and any pipes and apparatus for the conveyance, reception, or storeage of such water, for such remuneration in money as is agreed upon between the company and the person to whom the same is so let for hire; and such remuneration shall be recoverable in the same manner as the rates or sums due to the company for water; and such meters, instruments, pipes, and apparatus, shall not be subject to distress for rent of the premises where the same are used, or be attached or taken in execution under any process of any court of law or equity, or under or in pursuance of any adjudication or order in bankruptcy, or under or in pursuance of any other legal proceeding against the person or goods of the person in whose possession the same shall be.

Powers to Company for Ascertaining Quantity Consumed by Meter and for Removing Meters, &c.

D.—The officers of the company may enter any house, building, or lands to, through, or into which water is supplied by the company by measure, in order to inspect the meters, instruments, fittings, apparatus, and works for conveying, measuring, and regulating the supply of water, and for the purpose of ascertaining the quantity of water consumed or supplied; and may, from time to time, enter any house, building, or lands, for the purpose of removing or carrying away any meter, instrument, pipes, fittings, apparatus, or other works the property of the company; and if any person hinder any such officer from entering, and making such inspection, or effecting such removal, every person so offending shall, for every such offence, forfeit to the company a sum not exceeding five pounds: Provided always, that otherwise than with the consent of a justice, such power of entry shall not be exercised, except between the hours of ten in the forenoon and four in the afternoon.

Penalty on Wrongful Use of Water.

E.—Every person who, not having agreed to be supplied with water by the company, wrongfully takes or uses any water from any reservoir, watercourse, conduit, or pipe, belonging to the company, or from any pipe leading to or from any such reservoir, watercourse, conduit, or pipe, or from any cistern or other like place containing water belonging to the company, or supplied by them for the use of any consumer of the water of the company, shall, for every such offence, forfeit to the company a sum not exceeding ten pounds; and every person who, having agreed to be supplied with water by the company, wrongfully takes or uses any water from any such reservoir, watercourse, conduit, or pipe, or from any such pipe, cistern, or other like place, for any purpose other than the purpose for which he so agreed to be supplied, shall, for every such offence, forfeit to the company not exceeding ten pounds; and, in any of the cases aforesaid the company shall be entitled in addition, to recover from any such person the amount of any loss, damage, or injury, sustained by them by or in consquence of any such wrongful acts, by action at law or other proceeding or process in or issuable from the local county court, or in or issuable from any other court or tribunal of competent jurisdiction.

Water may be Cut off in certain Cases.

F.—If any person supplied with water by the company wrongfully do, or cause or permit to be done, anything in contravention of any of the provisions of the incorporated Act and this Act respectively, or wrongfully fail to do anything which, under any of those provisions, ought to be done, for the prevention of waste, misuse, undue consumption, or contamination of the company's water, the company may cut off any of the pipes by or through which water is supplied by them to him or for his use, and may cease to supply him with water so long as the cause of injury remains or is not remedied, and may also recover from him the amount of any loss, damage, or injury sustained by them by or in consequence of any such act or failure, by action at law, or other proceeding or process in or issuable from the local county court, or in or issuable from any other court or tribunal of competent jurisdiction.

Exceptions to Constant Supply and High Pressure.

G.—The water of the company need not be laid on or supplied constantly, or under a pressure sufficient to make it reach the top stories of the highest houses within the limits of this Act, in the cases in which such constant supply or sufficient pressure cannot be afforded from the pipes laid down by the company.

Occupier liable to Water-Rate in certain Cases.

H.—Except in the case in which the owner of any dwelling-house or tenement, the annual value of which shall not exceed the sum of ten pounds, shall have agreed with the company to pay the water-rent for the supply of water to such dwelling-house or tenement, the water-rent due or accruing due in respect of such supply shall be payable by, and may be recovered from, the occupier of such dwelling-house or tenement.

Particulars of Penalties, &c., to be Published.

I.—The company shall, from time to time, publish the short particulars of the several offences for which any penalty is imposed by this Act, or the incorporated Acts, or any of them, or by any bye-law of the company affecting other persons than the shareholders, officers, or servants of the company, and of the amount of every such penalty, and also of the rules and regulations to be for the time being in use, and observed within the limits of this Act, and shall cause such particulars to be painted on a board, or printed on paper and pasted thereon, and shall cause such board to be hung up, or affixed on or in some conspicuous part of the principal office or place of business of the company.

Interpretations.

K.—In this Act, the words "county court," and "court or tribunal of competent jurisdiction," shall mean any court possessing authority within the limits of this Act to hear and determine any causes and proceedings instituted therein for the recovery of debts; and in this Act, and any Act incorporated therewith, the words "rate" and "water-rate," and "rent" and "water-rent," shall respectively mean and be construed to imply the charge made for and in respect of the water supplied to or for the use or upon the responsibility of any person under the authority of this Act, and shall not be deemed to be in the nature of a general compulsory rate or assessment made or levied under the authority or subject to the provisions of any public Act or law, or to any process or practice of the courts of law, relating to the making and levying of general compulsory rates or assessments.

Register of New Patents.

946.—Henry Alexander Frederick Duckham, of Clerkenwell Green, in the County of Middlesex, gas-regulator manufacturer, for "*Improvements in gas-meters and regulators, and in compounding materials to be used as a coating for, or in the composition of, substances subject to the action of gas.*" Provisional protection only obtained. Dated April 17, 1861.

The first part of this invention consists in the application of slide-valves to gas-regulators generally, in lieu of the lift or clack-valves usually employed; which slide-valves are not liable to be fixed in the seats from the pressure of the gas, or to jump or produce irregularity of action, as observable in ordinary valves.

Secondly, in the application and use of glass, pebbles, or other stones or glazed ware, as the material of the valves in gas-regulators and meters; which materials are not subject to the action of the gas, or to the adhesion of any sticky matters which deposit on metal valves, and impede their action.

Thirdly, in the application of a float to the reservoirs or self-acting supply cisterns of gas-meters and regulators, to shut off the passage of gas through the regulator or meter before the cistern is empty, and so suspend the action of the meter or regulator.

This float is disposed near the bottom of the reservoir, and suspended by rods to a crosshead placed above the level of the water in the reservoir, and mounted on a rod which descends therefrom within a tube which descends below the reservoir into the water or fluid of the meter or regulator. The rod passes below this tube, and is then suitably connected with a lever or other valve disposed at the inlet-orifice of the outlet-tube of the gas, the whole arrangement being such that the float holds the valve constantly open so long as there is a sufficient supply of fluid in the reservoir, but closes it before the supply fails.

The fourth part of the invention relates to the application of a supply-tube from the fluid reservoir of wet gas-meters to admit the supply therefrom on both sides of the measuring-drum at a uniform level, which will interrupt the action of the meter if tilted forward, and, therefore, prevent tampering with it in that way, as also the application of a pipe from the dry well, which is carried round the extremity of the drum towards the back of the meter, is bent upwards a little above the water level, and down again so as to dip two or three inches, such dipping end being open if the meter be tilted backwards. When so fitted, the water would pass over the bend or syphon-like end of the pipe, and so enter the dry well and stop the action of the meter, and effectually prevent tampering by tilting the meter backwards.

The fifth improvement consists in the combination generally of dry gas-meters with dry gas-regulators, and wet gas-meters with wet gas-regulators; or it may be dry gas-regulators with wet gas-meters, or *vice versâ*, in one and the same machine or case.

The sixth part relates to the application of a composition, composed of gelatine and treacle, or other non-crystallizable saccharine matter, in about equal parts, and a small proportion of alum to metallic, or other surfaces, generally subject to the action of gas, in order to their preservation.

Flexible gas-tubing is sometimes made of such composition, in combination with other materials in lieu of the india-rubber, or other imper-

vious material usually employed. This composition is also used, with any suitable fabric or material for the formation of gasholders, and other chambers or surfaces, to contain gas, or which are subject to the action of gas.

1365.—GEORGE GLOVER, of 8, Queen Square, Westminster, for "*Improvements in gas-meters and pneumatometers.*" Provisional protection only obtained. Dated May 31, 1861.

This invention has for its object improvements in gas-meters and pneumatometers. For these purposes, in order to construct the registering apparatus of gas-meters and pneumatometers with facility, and to improve their working, each of the side frames, which receive and bear the ends of the axles of the train of wheels, is made in an irregular form, with projections thereon to receive and bear the several ends of the axes of the wheels, each projection being of such substance and form that it may readily be bent and set in any desired position, in place of, as heretofore, making the side frames of plates or other forms, having holes in them to receive and bear the ends of the axes of the wheels, as frames so formed will not admit of the positions of the holes being readily adjusted, in the event of the plates not being perfectly true in themselves or in their relation to each other.

The side framings are composed of an alloy of tin, preferably a compound of tin and antimony, which is not injuriously acted upon by coal-gas, and in which, at the same time, the axles will work with less friction than in the metals heretofore used.

In order to be able more readily, and with greater accuracy, to adjust the position of the pin by which the action of the link or connecting-rod communicates motion to the slide-valve of a dry gas-meter or pneumatometer, such valve-pin is attached by means of a projecting lug on the valve, the lug being formed with a slot through it, and the pin formed with a screw and nut, by which it is readily slid along the lug to the correct position, and there secured by the nut. And, also, in order to be able to adjust with greater accuracy the position of the crank or tangent-pin to obtain correct measurement, the crank is formed with a slot, and the pin is fixed therein by a screw and nut in like manner to the valve-pin before mentioned.

1366.—PAUL CAMERON, of Glasgow, Lanark, N.B., philosophical instrument maker, for "*Improvements in instruments for measuring, indicating, and regulating the pressure or flow of fluids.*" Patent dated May 31, 1861.

This invention relates to the arrangement and construction of apparatus suitable for registering or indicating the pressure of the atmosphere, as well as of steam, gas, or water. Under certain modifications, the instrument is also applicable as a means of regulating the pressure of steam, gas, or water, so as to cause it to flow in a regular and uniform manner, or to give an audible or visible signal upon a given predetermined pressure being exceeded. Under one modification, the arrangement is adopted for indicating the pressure of steam in boilers.

The apparatus consists of a metal box or case, which has a ring of metal cast on, or secured to a suitable base-plate. This ring has screwed to it a second and corresponding ring, between which and the face of the lower ring is interposed a disc of mica. This arrangement forms an air-tight chamber, which is, however, put in communication with the boiler by means of a pipe, which opens into the chamber. The disc of mica is connected, by means of a central universal joint, with a lever extending across the chamber, and centred on a pillar-piece at the upper part of the case. The lower end of the lever extends on each side in a lateral direction, forming a T-piece, the extremities of which are soldered to helical springs, which are connected, by end-discs, to the base-plate. These springs serve to keep the lever in a horizontal position, and the index to zero, when there is no pressure on the disc. Upon steam being admitted to the chamber, the mica is pressed or bulged outwards, and being connected to the lever, this motion is imparted to the indicating mechanism. A slot is made in the T-end of the lever, to admit of a traversing link being fixed therein. This link is jointed to a projecting arm formed on a small metal sphere which traverses to and fro on a horizontal screw. This screw is carried in a bracket-piece, fixed in the lower part of the base-plate, and it has fast to it a milled head, the turning of which causes the little sphere to traverse along the screw, in either direction as required. The sphere has fixed in the front part of its periphery a pin, which passes out through a slotted arm that forms a part of the spindle on which the quadrant for actuating the external index is fitted. This quadrant or segmental-wheel, extends upwards towards the centre of the instrument, where it gears into a pinion, the spindle of which projects out through the graduated dial-plate and has fast to it the index or pointer. When the steam presses on the mica, it lifts the primary lever which, being linked to the sphere, causes it to turn about its supporting screw. This motion is imparted through the quadrant to the index. The arrangement of the sphere on the screw admits of the pin which passes through the slotted arm being moved to or from the spindle of the quadrant, and thus imparting more or less motion to the spindle. In this way, the instrument may be adjusted so as to cause the indicator to traverse more or less over the dial, and thus admit of its ready adjustment to suit dials graduated either for low or high pressures. The instrument also forms a highly susceptible barometer. A thin film of mica is used for the vacuum-chamber, which is made air-tight and exhausted, so that the atmospheric pressure on the exterior of the film is rendered visible by the arrangement of the indicating mechanism.

Under another modification, the apparatus is adapted for regulating or controlling the pressure or flow of fluids. This is effected by a spring being arranged to press on the mica-disc in such a manner that its pressure can be regulated to any required force by means of a screw or other equivalent. The disc of the chamber is so arranged that the bulging of the mica shall cause the valve, which controls the flow of the fluid, to be more or less closed. Thus, when the pressure of the fluid from the source of supply exceeds the predetermined amount, the bulging of the mica actuates the controlling-valve, and partially closes it, so that the pressure or flow of the fluid is rendered uniform. By modifying this arrangement, the pressure of the fluid on the disc may be made to open a suitable jet or orifice, and so give either a visible or audible signal.

Another modification or arrangement of pressure-chamber is to form both the sides of films of mica, which are arranged in the retaining-frame with a certain degree of curvature. Upon admitting the fluid to this chamber, its pressure tends to straighten the mica, the motion of which is communicated to the index or other moveable detail.

The claims are for—

1. The general arrangement and construction of apparatus for measuring, indicating, and regulating the pressure or flow of fluids as herein-before described.

2. The use and application of mica in the construction of apparatus for measuring, indicating, and regulating the pressure or flow of fluids, or any mere equivalent for the said flexible substance.

3. The combination of parts forming the several mechanical arrangements by means of which the reciprocatory motion of the mica or other disc is imparted to the external index or pointer as described, or any mere modification of such arrangement.

1414.—EDMUND SMITH, of Hamburg, gas-meter manufacturer, for "*Improvements in wet gas-meters.*" Provisional protection only obtained. Dated June 5, 1861.

This invention relates to a combination of means, by which what are commonly called wet gas-meters are improved. Upon the axis of the measuring-drum or series of chambers is placed the usual worm-wheel to give motion to a toothed-wheel, the axis of which communicates motion to registering apparatus. Upon this or other suitable axis is fixed an arm, so constructed that, by acting upon another arm, or part of a water-scoop, or elevator, one end thereof is raised and depressed to take up water, or other fluid, from a reservoir provided for the purpose, and allow such water or other fluid to fall into the measuring part or main body of the meter. There is also an overflow at the required height to admit of any excess of fluid falling back again into the reservoir.

The gas entering the meter passes into a chamber, the lower end of which opens into the reservoir some distance below the ordinary water-line thereof. This chamber contains a float, which is also below the water-line, and is connected by a spindle with a valve, in such a manner that, when there is a deficiency of water or other fluid in the reservoir, the float will fall and close the valve and prevent the gas passing in. The cylinder and float being so deeply under water prevent a very strong pressure from closing the valve. A pipe from this chamber, below the valve therein, dips down to near the bottom of the reservoir to allow the water or other fluid to escape therefrom when required, and also by an arm or passage therefrom serves to convey gas into the centre of the measuring-wheel or series of chambers. The meter is supplied with water or other fluid by a pipe with a screw cap, and the surplus is removed by an inverted syphon-pipe from the reservoir. There is also another valve with float in the body of the meter adapted when there is a deficiency of water or other fluid in that part, or when the meter is tilted forward to close the outlet-valve.

1419.—JOHN BAILEY and WILLIAM HENRY BAILEY, of Albion Works, Salford, Manchester, Lancaster, turret-clockmakers, for "*Improvements in apparatus for indicating the speed, flow, pressure, and vacuum of liquids, and other bodies.*" Provisional protection only obtained. Dated June 6, 1861.

These improvements consist—

1. In substituting for the two or more weights or pendulums, levers and springs, in pressure, flow, and other gauges, where a diaphragm and piston are used, one lever epicycloidal of a peculiar shape attached to a weight or pendulum, against which lever the diaphragm and piston act. By these simple means the combination of several rollers, weights, levers, racks, and springs, is entirely dispensed with.

2. The same principle, together with springs, instead of a column of mercury, employed in combined pressure-gauges, indicating either vacuum or pressure, by means of tubes so arranged with taps that one tube will act on the diaphragm and indicate vacuum, and the other will act or press under and indicate pressure.

3. In the application of this principle to weighing machines.

4. Indicating the speed of engines and other machines, by means of a rod attached to the sliding piece of an ordinary governor, which, rising by the action of the governor and slide-piece, indicates on a gauge-dial, placed directly over the governor, the exact speed of an engine or any other body.

5. The improved manner of placing the syphon used in pressure-gauges, by coiling the syphon or tube round or inside gauges, in such a manner that it cannot be damaged, being out of sight.

6. The use of *papier maché*, vulcanite aluminium, and its alloys in the manufacture of gauges and indicators.

7. The application of governor balls to the ordinary colliery cage, or winding indicators, in conjunction with a steam-whistle, bell, or other alarm, for the purpose of indicating when the cage attains a dangerous speed.

8. The several indicators herein mentioned in conjunction, or in the same case with sewing-machines, time-pieces, or clocks, for indicating the daily, hourly, or weekly speed, or pressure, or the minimum and maximum speed only.

1448.—ALEXANDER ANGUS CROLL, of Coleman Street, London, engineer, for "*Improvements in the manufacture of sulphate of alumina.*" Patent dated June 7, 1861.

By the method generally adopted in the manufacture of alumina from shale and other aluminous matters, the material to be operated upon is together with sulphuric acid, (oil of vitriol), in a comparatively weak solution, placed in a suitable vessel, and then heat is applied to them and maintained until the desired solution of sulphate of alumina is obtained, by which considerable time is occupied. By this improved process, supposing the object to be the production of sulphate of alumina in the form of cake, to be used in the manufacture of paper or otherwise, the shale or other aluminous matter, as china clay, to be operated upon having been roasted, as is well understood, is placed, after being finely powdered, in a suitable vessel, by preference in a dry state, and also by preference is subjected to heat until it has attained a temperature of about 300° Fahr. While thus heated sulphuric acid of about 1·700° strength is caused to

flow upon it, which sulphuric acid has also been previously heated to a temperature of about 300° Fahr., in the proportion of about twenty parts by weight of sulphuric acid to about twenty parts by weight of aluminous matter, the proportional quantity of acid required depending upon the amount of alumina, apart from foreign matter, in the aluminous material employed, which is readily ascertained by the usual tests. These matters may be intimately mixed, and by these means a solution of sulphate of alumina will be very quickly obtained. It is found better to retain the heat in the whole mass until the temperature is reduced to about 150° Fahr., for which reason this operation is best conducted upon a mass of not less than five tons, which may then be cut into the desired forms and sizes of cakes.

When the sulphate of alumina to be obtained is required to be used in the manufacture of alum, the previously described process may be pursued, or the following—that is to say, shale, after being roasted in the ordinary way, and before being subjected to the action of the sulphuric acid, is moistened with water, at a temperature of about 212° Fahr., and the heat of it generally is raised to about that temperature, when it is subjected to the action of sulphuric acid of about the strength and temperature, and relative proportions above stated. The mass being intimately mixed, it is better not to be disturbed until the temperature has been slowly reduced to about 200° Fahr., after which the sulphate of alumina may be dissolved out by boiling water for the manufacture of alum.

1453.—John Farrand Clarke, of 26, Moorgate Street, London, gas and steam engineer, for "*Improvements in apparatus for regulating the supply of fluids.*" Patent dated June 7, 1861.

The object of this invention is to regulate the supply of fluids to boilers and other vessels or holders. For this purpose, a cock or tap is employed, which controls both the inlet and outlet at the same time, and by the same action of the handle, key, or spindle. The same cock thus effects both the supply and discharge at the same time. It is so arranged, that the fluid can only be drawn off when it has reached a certain level in the vessel or holder, the supply being kept up as fast as the fluid is so discharged; so that the fluid in the vessel or holder is always maintained at the height required. To draw off the fluid from the desired level, there is fitted to the cock a pipe communicating with, or forming part of, the discharge way, and extending upwards to such level within the vessel or holder in which it opens, at the height required. It is preferred to have this pipe moveable, or adjustable, so that its angle or position in the vessel may be varied, and to form its top opening funnel-shaped, or of larger diameter than the rest of the pipe.

In this improved arrangement of cock, the plug is extended beyond the discharge communication into a supply or inlet passage, which is brought into the vessel through the tail of the cock, and a recess socket, or hollow is formed in this extended part of the plug with an orifice at the side, which communicates with the inlet when the plug is turned to open the discharge way; but, when the plug is turned to close the discharge, the blank part of the recess comes against the inlet and closes it. Thus, as fast as the fluid is discharged, fresh fluid enters and keeps the proper supply in the vessel.

By applying the apparatus to boilers for heating water, the upper layer of, or hottest, water will thus be drawn off. The apparatus also serves as an indicator, because, if from some obstruction or otherwise, the supply should not attain the proper height, the same will be indicated by the cessation of the discharge.

The claims are for:—

1. The general arrangement and combination of parts constituting the improved apparatus for regulating the supply of fluids as hereinbefore described.

2. The improved construction of cock, hereinbefore described, in so far as regards the arrangements therein, whereby it is rendered capable of serving to control the inflow of fluid through it, as well as the outflow, *i.e.*, in so far as regards the arrangement and combination in the manner, hereinbefore described, of the additional fluid-way formed through the cock and the recess in the plug, and opening at the side of such recess, whereby a passage is opened and closed, when such discharge-way is opened and closed, as hereinbefore explained.

3. The combination with the improved cock, arranged as described, of an internal outlet-pipe, or pipe leading into the discharge fluid-way of the cock, and placed within the boiler, or other vessel from which fluid is to be withdrawn, so that such fluid can only be drawn off when at the required height, as hereinbefore described.

1497.—Charles Chalmers, of Edinburgh, Midlothian, N.B., gentleman, for "*Improvements in gas-stoves.*" Provisional protection only obtained. Dated June 11, 1861.

This invention relates to the arrangement or construction of gas-stoves which the inventor designates the "Merchiston gas-stove," suitable for heating purposes, and is based, to a certain extent, upon an invention of a somewhat similar nature, for which letters patent were granted to him on the 15th of November, 1859, No. 2588.

Under one modification, the improved gas-stove is arranged as follows:—Two, three, or other suitable number of Bunsen burners are arranged upon a base-plate. Each of these burners is connected, by a separate pipe and stop-cock, with the pipe from which the supply of gas is obtained, so that one or more burners may be used as required. The Bunsen burners are surrounded by a small air-chamber, which is furnished with a door in front, to admit of lighting and regulating the burner. An air-pipe is conducted from the exterior of the building, and concealed, if required, either beneath the floor of the room or behind the skirting-boards. This pipe is, by preference, about 3 inches in diameter; it opens into the air-chamber, where the air mixes with the gas and flows up the tube of the burner, and greatly adds to the heating power. The stove consists of a metal cylinder of about 3½ feet in height by 15 inches in diameter, and the cylinder may be formed of iron, brass, plated metal, or of silver. The cylinder is supported by tripod feet, which extend to the upper part of the air-chamber, so as to admit a ready access thereto. The top of the cylinder is, by preference, of a dome-shaped figure, and is completely closed; the lower part of the cylinder is formed of a conical shape. In the centre of the stove is fitted a vertical tube, which extends to within a short distance of the top of the cylinder, and passes out through the bottom and into the air-chamber, where it terminates just above the burners. A door in front of the cylinder affords access to the interior for the purpose of cleaning it when necessary. The admixture of gas and air burns with a blue flame, giving off intense heat; and the volume of heated air passes up the central tube, and then into the stove, the surface of which radiates the heat into the apartment or building.

The most important feature in the arrangement of this stove, is the mode of getting rid of the vitiated air and products of combustion. These impurities are carried off at the lower part of the stove by means of a pipe which is carried out from the bottom, or near to the bottom of the stove. This pipe extends either outside the building, or is carried into a contiguous chimney. As the external air flows in through the inlet-pipe, and passes round and through the gas flame, it becomes very highly heated, and the heated air, as it impinges against the top of the stove, parts with a portion of its heat, and so becomes specifically heavier in proportion. The current of heated air, as it ascends continuously, occupies the place of the cooler portion of the air; and thus the vitiated air is caused to descend, and pass off by the outlet-pipe.

In its downward passage, the air gives off its heat to the surrounding metal of the stove, so that it passes away by the outlet-pipe, carrying with it little or no heat. In this manner, the whole of the heat is economized and rendered available, whilst the building or apartment is kept entirely free from the impurities arising from the combustion of the gas. The vitiated air passes off into the outlet-tube, so that the air of the room or building is uncontaminated by the presence of the stove, or at times is maintained at an agreeable temperature, a ventilator only being necessary at the upper part of the room to carry off the heated air. This stove may also be arranged so as to adapt it for culinary and other generally similar purposes.

APPLICATIONS FOR LETTERS PATENT.

3126.—Henry John Odling, of Smith Square, Westminster, engineer, for "*Improvements in the mode of, and apparatus for, feeding steam-boilers; also, in apparatus for supplying fluids for other purposes, and in apparatus for raising fluids.*" Dec. 13, 1861.

3148.—William Husband, of Hayle, Cornwall, for "*An improved water safety-valve.*" Dec. 14, 1861.

3161.—John Bickerton Bunney, electro-plater, and Thomas Wright, both of Birmingham, Warwick, electro-plater, for "*Improvements in ornamenting metallic and non-metallic bedsteads, and other articles made principally of metallic rods or tubes.*" Dec. 17, 1861.

3167.—Samuel Sheppard, of Birmingham, Warwick, manufacturer, for "*A new or improved tap or stop-cock.*" Dec. 18, 1861.

3171.—Asmus Petersen, of Wittkiel, Angeln, Duchy of Schleswig, landowner, for "*An improved system of drainage and irrigation for meadow, and other land.*" Dec. 18, 1861.

3184.—Joseph Henry George Wells, of 2, Sandhurst Villas, Binfield Road, Stockwell, Surrey, civil engineer, for "*Improvements in pumping elastic fluids.*" Dec. 19, 1861.

3187.—James Standfield, of Aylesford, Kent, engineer, and John Standfield, of Stratford, Essex, engineer, for "*Improvements in machinery or apparatus for giving motion to ships and machinery, and for raising water.*" Dec. 20, 1861.

3197.—John Redfern, of Hanley, Stafford, for "*Improved apparatus for raising the temperature of air, in order to warm churches, conservatories, houses, and other buildings or places.*" Complete specification. Dec. 20, 1861.

3208.—William Mattieu Williams, of Handsworth, Stafford, teacher, for "*An improvement, or improvements in treating coal and other bituminous minerals and peat, in order to obtain solid and liquid hydrocarbons therefrom, and in apparatus to be used for that purpose.*" Dec. 21, 1861.

3210.—William Charles Miles, of Railway Place, Shoreditch, London, lamp manufacturer, for "*Improvements in lamp-glasses.*" Dec. 21, 1861.

GRANTS OF PROVISIONAL PROTECTION.

2495.—William Clark, of 53, Chancery Lane, London, engineer and patent agent, for "*An improved gas-regulator and purifier.*" A communication. Oct. 5, 1861.

2933.—Renil De Clercq and Emile Chazelles, of Brussels, Belgium, mechanical engineers, for "*Improvements in apparatus for raising and supplying water to boilers, and for other purposes.*" Nov. 22, 1861.

3041.—William Edward Newton, of the Patent Office, 66, Chancery Lane, London, civil engineer, for "*Improvements in pumps.*" A communication. Dec. 4, 1861.

3048.—John Knowelden, of Southwark, Surrey, engineer, for "*Improvements in pumps.*" Dec. 5, 1861.

3051.—William Dicks, of Floore, Northampton, smith, for "*Improvements in pumps.*" Dec. 5, 1861.

3052.—James Cochrane of Harburn, Midlothian, gentleman, for "*Improvements in wet gas-meters.*" Dec. 5, 1861.

3065.—Heinrich Gottfried Schramm, of 149, Rothenburgsort, Hamburgh, for "*Improvements in rotatory engines and pumps.*" A communication. Dec. 6, 1861.

3066.—John James Russell, of the Crown Tube-Works, Wednesbury, Stafford, patent tube manufacturer, and Burdett Lambton Brown, of the same place, engineer, in the employ of the said John James Russell, for "*Improvements in apparatus used in the manufacture of paper tubes.*" Dec. 6, 1861.

3069.—Richard Jolley, of 47, St. John Street, Smithfield, London, for "*An improved apparatus for heating, cooling, or drying, infusing, extracting, or absorbing vapours or gases for manufacturing, medical, or domestic purposes, and for preserving liquids and solids, alimentary or otherwise.*" Dec. 7, 1861.

3090.—Hector Alexander, of Glasgow, Lanark, N.B., gas-burner manufacturer, for "*Improvements in turning apparatus for making gas-burners.*" Dec. 10, 1861.

3108.—William Henry Tooth, of Rhodeswell Road, Middlesex, engineer, and William Yates the younger, of Parliament Street, London, agent, for "*Improvements in the manufacture of iron and steel, and in the machinery, apparatus, or furnaces used therein, and for the production of gas to be employed in such manufacture.*" Dec. 11, 1861.

INVENTION PROTECTED FOR SIX MONTHS BY THE DEPOSIT OF A COMPLETE SPECIFICATION.

3197.—John Redfern, of Hanley, Stafford, for "*Improved apparatus for raising the temperature of air, in order to warm churches, conservatories, houses, and other buildings or places.*" Dec. 20, 1861.

NOTICES TO PROCEED.

1969.—Nicholas Doran Proby Maillard, of Dublin, Ireland, for "*Improvements in self-acting and inexhaustible hydraulic and atmospheric motive-power engines.*" Aug. 8, 1861.

1990.—Richard Alfred Godwin, of 151, Newport Street, Paradise Street, Lambeth, Surrey, for "*Improvements in pumps.*" Aug. 9, 1861.

2026.—William Wilds, of Hertford, architect and surveyor, for "*Improvements in apparatus for ventilating.*" Aug. 14, 1861.

2075.—Frederick Gye, of the Royal Italian Opera, Covent Garden, for "*Improvements in constructing gasometers and gasometer-tanks.*" Aug. 20, 1861.

2084.—William Clark, of 53, Chancery Lane, London, engineer and patent agent, for "*Improvements in the construction of buildings whereby to utilize the waste heat passing up the chimneys.*" A communication. Aug. 21, 1861.

2102.—William Baines, of the London Works, Smethwick, Stafford, engineer, for "*Improvements in the construction of girders, frames or other apparatus fixed or moveable, and for certain peculiar forms or sections of iron used therein.*" Aug. 22, 1861.

2827.—David Yoolow Stewart, of Glasgow, Lanark, N.B., iron-founder, for "*Improvements in the manufacture of cast-iron pipes, and similar articles, and in apparatus to be used therein.*" Nov. 11, 1861.

Legal Intelligence.

COURT OF COMMON PLEAS.

GUILDHALL, SATURDAY, DEC. 14.

(*Before Lord Chief Justice* Erle, *and a Special Jury.*)

HORTON *v.* MABON.

This was an action for an infringement of the plaintiff's patent for "Improvements in the construction of gasholders." The defendant pleaded "Not Guilty," and a denial of the validity of the letters patent.

Mr. Bovill, Q.C., and Mr. Webster, appeared for the plaintiff; and Mr. Grove, Q.C., Mr. Lush, Q.C., and Mr. Hindmarch, for the defendant.

Mr. Bovill, in opening the case, said the plaintiff was a manufacturer of gasholders and steam-engine boilers, carrying on business at Smethwick, near Birmingham, and the defendant was a gasholder maker, carrying on business at Manchester. In 1851, the plaintiff obtained letters patent for "Improvements in the construction of gasholders," which patent he now charged the defendant with infringing. He (Mr. Bovill) did not know that there would be any question about the infringement—*i.e.*, that the defendant had done precisely the same thing as the plaintiff had done; but, now that he was challenged with the infringement, it appeared that he set up as a plea the invalidity of the plaintiff's patent, on the ground that, at the time it was granted, the invention which it was intended to secure was not new. The improvements which were the subject of the letters patent, consisted of three parts. The first related to the guide-columns or pillars, used for the support of gasholders; the second, to certain arrangements of guide-rollers, bars, and plates; and the third, which would be the main point in the present inquiry, to the construction of the hydraulic cups or joints of gasholders. The two former it would not be necessary to go into, unless his learned friend (Mr. Grove) desired it. It would be convenient if an intimation were now given by the defendant's counsel, as to the course which it was intended to pursue in reference to them.

Mr. Grove objected to the fairness of such a challenge, but stated in reply, that the question arising on the first two points was a very small matter in this inquiry—viz., whether they were the subjects of a patent? the main question would be as to the third improvement.

Lord Chief Justice Erle said, if any question at all was to be raised upon the first or second points, it would be necessary to try the case as if they were real questions in the cause.

Mr. Grove said it might be taken substantially that the third point was the only one in dispute.

Lord Chief Justice Erle inquired whether, if the plaintiff's patent were proved to be valid, the infringement of it was admitted?

Mr. Grove said he could not admit it.

Lord Chief Justice Erle said the questions, then, to be tried, would be the validity of the plaintiff's patent as to the third part of the invention, and whether the defendant had infringed it, the right being reserved to go back to the other points, if anything arose in the course of the trial to render it necessary.

Mr. Bovill proceeded to explain to the jury, with the aid of models, &c., the principle of the construction of telescopic gasholders, and the mode of their operation. Referring to the necessity for having a perfect joint between the upper and lower lifts impermeable to gas, he described the hydraulic cup, or valve which, he said, was formerly made of sheet or plate iron, with angle iron at the corners, which were bolted or rivetted together. Various attempts had been made to improve upon the old form of construction, but none had been so effectual as the invention of the plaintiff which, though it appeared to be a very simple matter, was really one of great importance, as, by its adoption, a saving of something like £100 was effected upon every gasholder which was made. The desideratum was to get rid entirely of the inconvenience of having to use three pieces of iron, and the expense of all the necessary bolting and rivetting. The peculiar mode adopted by the plaintiff was to make a cup of wrought iron, and secure it on one side by rivets to the gasholder, and on the other side in a similar manner to a strip of sheet or plate iron, in order to form the other side of the cup or valve, instead of forming it of a plate of iron with double angle irons. This, as the evidence would show, was entirely a new thing when the plaintiff specified his patent in 1851; indeed, it was clear that, if any one had conceived of such a mode of construction previously, he would necessarily have adopted it on account of its simplicity and the economy with which it was employed. The defendant, however, now pleaded that the invention was not new at that time; and there were two grounds upon which that plea was sustained. In the first place, he referred to "Clegg's practical Treatise on the Manufacture and Distribution of Coal Gas," published in 1841; in which were given a description and drawing of the hydraulic cup of a gasholder which he said was of the same construction as the plaintiff's. He (Mr. Bovill) would call witnesses to prove that it represented nothing of the sort, nor any approach to it; and a subsequent edition of Clegg's Treatise, published in 1859, which gave a more elaborate drawing of the same gasholder, showed that it was a much more complicated contrivance than the plaintiff's. The first was a mere outline drawing, exhibiting no rivets, nor indeed anything more than the general form and construction of a gasholder. The second mode by which the defendant sought to invalidate the plaintiff's patent was, by alleging that the plaintiff had used his invention prior to the date of the letters patent, and having thus published the nature of it to the world, he could not substantiate a claim to the exclusive enjoyment of it. The facts on this part of the case were these:—in the autumn of 1850, the plaintiff, having an order for gasholders for a company at Dublin, and having then found out his improved plan, though he had not put it in practical use, prepared the plates and everything necessary for constructing the holders upon the new principle, and despatched the various parts to their destination. But, before the gasholders were put together and erected, the patent had been taken out. The defendant now pleaded that, upon this state of things the patent was bad, because the invention had been given to the public. This was a matter which it would not be for the jury to decide. The point had been well considered in the case of *Betts v. Menzies*, where the patentee had made a large quantity of capsules.

Lord Chief Justice Erle said that case was before his mind, but he did not see the analogy between it and the present case. There, the patentee specified rolling tin with lead, but then Dobb's patent had been published and found useless. Here, the point was whether there was a sufficient publication?

Mr. Bovill said, that was not the point on which it went to error, but the question which the Queen's Bench decided. In that case, the plaintiff had manufactured a large quantity of capsules, which he had directed should not be issued until the patent was sealed.

Mr. Grove said the plaintiff in that case, had prepared a large stock of capsules, which, when he got his patent, were to go to sale, and it was thought that he would thus have more than fourteen years advantage. But, here the materials were actually sold, and sent away.

Mr. Bovill said on the first trial of *Betts v. Menzies*, the court held that there was no previous publication. On the authority of that case, and also that of *Lewis v. Marling*, which involved a question as to a patent for a cloth-shearing machine, and the case of Mr. Strutt's suspended wheel, which was worked for two years upon the road between Derby and Belper before a patent was taken out, he should contend that there was no publication in the present case to deprive the plaintiff of the benefit of his invention during the continuance of his grant of letters patent. The erection of the gasholder in Dublin was but the first experiment; it was the first holder of the kind put up, and it was uncertain whether it would succeed or not. Indeed, there were some difficulties after it was erected, and the company were very nearly rejecting it altogether. It was found out, however, that the defects did not arise from the particular construction, but from other causes which were counteracted, and it was then seen to be a most valuable invention. At first sight, it would appear to be an extremely simple thing, and, apparently, there was but little difference between the one form of cup, and the other; but, then, it must be borne in mind that, in constructing a gasholder, they had to deal not with flat plates and straight pieces of angle iron. All these things had to be curved, and it did not at all follow that what would answer when applied to the straight, would answer when applied to the curved form. This could not be discovered until after the the gasholder was erected, and, therefore, although the plaintiff was satisfied as to the utility and ultimate success of his invention, all that he had done up to the period of the date of his letters patent was mere experiment. Upon these facts, he (Mr. Bovill) would submit that the plaintiff was entitled to a verdict, unless his learned friends on the other side should succeed in shaking the evidence he was about to adduce. He now came to another part of the case, which was this:—The defendant said, assuming the patent to be a perfectly good patent—assuming that this mode of construction was perfectly new, and that the plaintiff was entitled to the benefit of the invention—yet he, the defendant, had not infringed it. This was a question entirely for the jury to determine, upon the evidence that would be put before them. He (Mr. Bovill) would prove that the defendant had manufactured gasholders precisely, and without the slightest variation, in accordance with the plaintiff's patent. And, not only so, but, after the plaintiff had enrolled his specification—which he did on the 2nd of July, 1851—the defendant actually, under the Registration of Designs Act, registered a design for a cup-holder precisely and in every respect the same as the plaintiff's, which would be seen from the office copy of the drawing now produced. His learned friend, Mr. Grove, would probably say that it was not the same thing; but he thought the jury would agree with him, after looking at the drawing, that there was not the slightest difference. The defendant described it as a design for the cup and dip of gasholders—the dip being constructed precisely on the same principle as the cup, and being, in fact, the cup reversed. He did not at all see what question could be raised on this part of the case. He did not suggest that the defendant inspected the plaintiff's specification, and immediately copied it, and registered it as his own—no man would be so foolish as to do that, because the thing must eventually be found out and exposed; but it certainly was a somewhat curious fact, that, a short time after the plaintiff specified his invention, the defendant registered a design precisely similar. And, moreover, it was an important point, as bearing upon this part of the case, that the defendant, who now said there was nothing new or of value in the plaintiff's invention, considered it at that time so far a new and valuable discovery, that he actually registered it, and thus sought to secure the benefit of it to himself. He (Mr. Bovill) would also call the attention of the jury to a letter written by the defendant, on the 4th of April, 1860, after he was challenged with an infringement of the plaintiff's patent. In that letter, defendant, addressing the plaintiff, said, "I have received an application for information concerning your patent for gasholder-cups and dips. I wished you, at the time you took proceedings against me, to come to an understanding, that the thing might be kept to ourselves, as it was advantageous in making gasholders. I am clear that I was the first to use double-angle iron rolled for that purpose. If your patent did include mine, I have

proof that you committed an act which made your patent void. If you wish the thing to be kept, I have no objection, provided we can arrange as to terms. An early answer will oblige." Clearly, the defendant thought it was new in July, 1851, as he then registered a similar design; and yet he now said the invention was not new, when the plaintiff took out his patent a fortnight before. He then considered it valuable, or he would not have attempted to secure the benefit of it to himself; and yet he now came forward to say it was a trumpery invention, and that, by reason of something the plaintiff had done, the patent was void. These were the short circumstances of the case; and he thought the matter would be at once disposed of, as soon as the facts he had stated were put in evidence.

Mr. WEBSTER put in the letters patent, and the specification thereof. The nature of the invention, as described in the latter, was, so far as relates to the cups of gasholders, as follows:—"My third improvement consists in forming the top and bottom of the water-cup or hydraulic joint of gasholders of sheet or plate iron, wrought to the shape required for such parts, instead of using angle iron and sheet iron, bolted or rivetted together, which renders the manufacture more costly." And, in describing the drawing attached to the specification, the plaintiff said—"Instead of forming the cup or valve of sheet or plate iron, with angle iron at the corners, as in the ordinary mode, I make a cup of wrought iron, and secure it on one side by rivets to the gasholder, and, on the other side, in a similar manner to a strip of sheet or plate iron, in order to form the other side of the cup or valve. By this means, as the rivets on the top and bottom of the cups are dispensed with, and only one row of rivets on each side is required, a great economy in the construction of gasholders is effected." The third claim is "for the mode herein shown and described, of constructing the hydraulic cups or joints of gasholders, or any other mere modification thereof, in which the top or bottom of the hydraulic joint or valve is formed of plates of iron, made or bent into a cup shape so as to admit of the valve being made complete, and attached to the gasholder, without the necessity of employing angle iron and double sets of rivets, as is usually the case." A copy of the defendant's registration was also put in, and the correspondence which had passed between the parties. The following evidence was then given:—

Mr. *Lewis W. Pritchard*, examined by Mr. WEBSTER.

I am the engineer of the Western Gas Company, whose works are situated at Kensal Green. I have been practically acquainted with gas-works for twenty-three years. I have seen the plaintiff's specification and the drawings relating to the third part of his improved construction of gasholders. To my knowledge, that was a new invention in 1851.

Mr. BOVILL asked whether it might be taken that the specification sufficiently described the invention?

Mr. GROVE said it was difficult for him to make such an admission.

Lord Chief Justice ERLE: That a workman of ordinary skill could construct the instrument from the description in the specification, is taken as proved.

Cross-examination continued: These gasholders are sometimes of very large dimensions. The largest I know of is 200 feet in diameter, and they vary from that size down to what are called domestic gasholders, which are from 12 inches to 23 or 24 feet. The height of the one which is 200 feet in diameter, I am not sure of, but I think it has two lifts of 30 feet each. In the construction of these telescopic gasholders, the cup or hydraulic joint is an essential part. Previous to 1851, these cups were constructed with two-angle iron, according to the model produced, with four joints and four rows of rivets. In a gasholder of 200 feet diameter, the length of the hydraulic slide would be rather more than 600 feet. The plates of which they were composed would have to be cut to the curve, the gasholder being circular; also the angle irons. By the plaintiff's mode of construction, two rows of rivets are got rid of, by which the facility of manufacture, and fixing when made, are increased, and also the economy. By the old mode, the plates had to bend to the curve, and the workman had to be in a peculiar position while making them. I have roughly estimated the saving effected in constructing a holder of 150 feet diameter, on the plaintiff's mode, at the Western works, at above £100. There is a saving of the two pieces of angle iron, amounting altogether to something like 2000 feet—in weight from 8 to 10 tons of iron—and also two joints of the same length. The gasholder is, of course, lighter to that extent, which is a great consideration in telescopic gasholders; it is also tighter, and less liable to leak. I have seen the drawing, figure 35, in the first edition of Clegg's Treatise. It does not describe anything at all of the same kind as the plaintiff's.

Cross-examined by Mr. GROVE: Angle iron is a very old thing, and is used for a variety of purposes. Double-angle iron was also well known, and extensively applied, before the date of the plaintiff's patent, for roofs, ships, gutters, &c. I am not aware of its having been used in the circular form, but more or less bent, according to the purpose for which it was required. The rivets are inserted when they are hot, both in the old and new modes of construction. I have been for some years a manufacturer of gas-meters. Some of those instruments are soldered and some are rivetted. It would require, with angle iron, that there should be a certain breadth at the bottom, in order to effect the rivetting with facility. Angle iron is of various sizes, and it depends upon the extent of the gasholder as to what size would be employed. The ordinary size is about 5 inches. If the cup were very narrow—say, two or three inches only—and the flanges very narrow, it could not be got at so easily for the purpose of rivetting. If large plates were sent to me with double-angle iron, I should have known what they were intended for. If I read the plaintiff's specification, where he says, "the top or bottom of the hydraulic joint or valve is formed of plates of iron made or bent into a cup shape," I should understand simply that the plates were bent into a cup shape originally, and were to be rivetted to the plates of the gasholder, and not that a plate of double-angle iron was to be provided. In my judgment, a person purchasing the angle iron formed ready for the purpose, and so using it to gasholders, would be within the plaintiff's specification. If it were not applied to a gasholder, I believe it would not be.

Re-examined by Mr. BOVILL: Double-angle iron, before the plaintiff's patent, was rolled in straight bars; I never knew it rolled with a curve. In constructing a cup with double-angle iron, it is necessary to arrange it so as to bring it into the curve of the gasholder.

Mr. BOVILL: Did you ever know of double-angle iron curved used before in the construction of the cups of gasholders? I did not. The plaintiff describes here the mode of making the cups.

Mr. GROVE: The mode of making? Where is it described?

Mr. BOVILL: At page 4 of the specification: "The peculiar mode of constructing the hydraulic cup, valve, or joint, &c. I make a cup of wrought iron, and secure it on one side by rivets to the gasholder, and on the other side in a similar manner to a strip of sheet or plate iron, in order to form the other side of the plate or valve." He also claims the mode of constructing the cups.

Mr. GROVE: I see nothing there as to the mode of construction. It is as well we should understand each other. I do not know whether my friend says the mode of manufacture is part of the claim?

Lord Chief Justice ERLE: I do not see that the patentee does claim any mode of construction, as if he had found out a particular mode. He assumes that everybody knows that wrought iron can be wrought in the shape of that cup which he has drawn. He does not point out any particular mode of working iron; he assumes that everybody knows that.

Mr. BOVILL: He does not claim the mode of manufacturing the iron, but of constructing the cup.

Re-examination continued: In all cases, where two single angle irons were formerly used, the plaintiff's mode of rivetting can be more easily effected with double-angle iron.

By Mr. GROVE: The drawing in Clegg's Treatise shows the plate of the gasholder as forming the cup. No doubt it shows "a plate of iron bent into a cup shape." Assuming the inner portion of the cup to be made of iron, it does not show that it is a piece of double-angle iron. The difference between this and the plaintiff's invention is, simply that in the drawing the plates of the side of the gasholder appear to form the whole of the cup to the extreme height on the other side, which is not what the plaintiff has patented. There is here no attachment to the gasholder; it is part of the gasholder itself, and there is no joint shown. The plaintiff shows a mode by which the joint can be made; Clegg's book gives no description as to the mode of construction. If the lower plates of the cylinder of the gasholder were turned up, or bent into a cup shape before the erection of the holder, that would not be the plaintiff's patent. The broad distinction between Clegg's drawings and the plaintiff's, is that the former show an impracticable mode of making the cup. If the lower plates of a gasholder could be turned up or bent into a cup shape, it would be a great improvement, even upon the plaintiff's patent, but it is not possible; as you have not to deal with straight but curved plates in making a gasholder, which is now always made circular, common sense tells me that the plaintiff in his specification confines himself to a gasholder of that shape. I do not know exactly how the plates are curved; but, I believe, they are rolled when in a hot state. The difficulty of constructing the cup, by turning up the edge of the curved plate, arises from the necessity there would be for the metal to expand in one direction, and not in the other. It would also require more expensive machinery for the purpose, and there would be an undue strain upon the outer angle and bottom of the plates, which would injure them. The upper part of the plate, I think, would add to the strain; they are generally about 18 inches on each side, which would not yield to the treatment so easily as narrow plates.

By Mr. BOVILL: The plaintiff's specification describes a telescopic gasholder, and a cup applicable to it. I have never known telescopic gasholders made in any other than a circular form. The usual length of the plates employed for the sides of a gasholder is from three to six feet, in the direction of the circumference, their height being about two feet. Speaking as an engineer, I say that it is impracticable to make the lower plate of the gasholder and the bottom and outer side of the cup out of one piece of iron.

Mr. *Thomas Greaves Barlow*, examined by Mr. BOVILL.

I am a civil engineer, and have devoted a great deal of attention to the construction of gas-works. I have been connected with the profession for upwards of thirty years, and have had a great deal of experience in all descriptions of gas machinery. I have been familiar with the mode of constructing telescopic gasholders ever since they were first introduced. I have never known them of any other than a circular shape. The hydraulic cup is applicable only to gasholders of that description. The ordinary length of the plates which are used in them is about 4 feet 6 in the direction of the circumference. The outer plate, which is called the dip-plate, is about 6 feet. It would be possible, provided the iron were of very superior quality to form a cup by turning up the plate at right angles, but I have never heard of its being done. In my judgment, in a commercial point of view, it would be impracticable, as it would be necessary to use iron worth £4 a ton more than that which is usually employed. From £10 to £11 is the value of the ordinary sheet-iron used for gasholders; the other would be worth from £14 to £15. The model correctly exhibits the old mode of constructing the hydraulic cup, with four joints and four rows of rivets. I have looked at the drawing in the first edition of Clegg's book. It indicates the mode of sealing by means of a water-joint, so as to prevent the escape of gas.

Mr. GROVE objected to the witness giving an interpretation of the book, which he contended it was for the court to do.

Lord Chief Justice ERLE said, in cases of patents, where the defendant contended that the invention had been described in a former publication, if manufacturing skill was required to understand and apply that former description, a practical witness ought to be asked the meaning of it.

Mr. GROVE thought that was only the case where there was an ambiguous word or term requiring interpretation.

Lord Chief Justice ERLE said, also when manufacturing skill was required to understand it.

Mr. GROVE: If your lordship thinks it admissible, I have made the objection.

Mr. BOVILL: I will not risk the objection. (To witness:) Do you find anything in that book which at all describes the plaintiff's invention?

Witness: I do not.

Examination continued: There is nothing in the book that would lead me, as a practical man of thirty years experience, to adopt the plan which the plaintiff claims to have found out. I was not aware of the existence of such a plan, before the date of the plaintiff's patent. I am not the editor of the new edition of Clegg's Treatise. I was asked to give some assistance to the editor, so as to make it a practical work. I should say that the original edition was written by a person who was not a practical man, and who had never constructed a gasholder in his life. That edition was of no practical use to gas makers. It is a book that has been well known to gas engineers ever since its publication in 1841. There was a second edition in 1853, which contains the same description of drawings. Everything I find there is applicable to the old form of hydraulic cup. It does not describe the mode of making the joint in detail. I have seen the drawing of the invention registered by the defendant. It is decidedly the same thing as that indicated in the drawings attached to the plaintiff's specification.

Cross-examined by Mr. HINDMARCH: The hydraulic cups might be applied to polygonal gasholders. It would be more expensive, and there would be greater difficulty in adjusting them. In Clegg's Treatise, there is shown and described a hydraulic cup or joint. I find in plate 17 that one line represents the cup, and sides, and top of the gasholder; so that it appears as if all were made in one piece. It is usual to make gasholders of thin sheet iron—generally with a framing of angle iron or T-iron, covered with sheet iron. The thickness of the plates depends upon the size of the gasholders. In this book of Clegg's, he says, "The diameter of the vessel may be from 30 to 50 feet, and not more." When of 50 feet, the thickness of the iron of the cups would be what is termed No. 10 gauge, *i.e.*, less than

one-eighth of an inch in thickness. It would be impossible to bend iron of that description into a cup shape, as here represented. Supposing it were possible, it might then be described as being "formed of plates of iron, made or bent into a cup shape, so as to admit of the valve being made complete." But it would be impossible to bend it at right angles, except with charcoal or Swedish iron, or other iron of superior quality. It might then be practicable, so long as the hydraulic lute was not curved. I do not think the lute could be curved to the circle of the gasholder after having been put in this form. Double angle or trough iron is not a very old article of manufacture. It was known before the date of the plaintiff's patent. It was not used in the construction of gasholders. I have only then seen it used in ships keels. When so applied, it was rivetted substantially, as in these cups.

Re-examined by Mr. BOVILL: I have never seen a plate continued from the side of the gasholder, round the cup, and up the other side. I say it would not be commercially practicable, and, even with the best iron, I doubt whether you could give it the necessary radial curve.

Mr. *Frederick John Evans*, examined by Mr. WEBSTER.

I am engineer to the Chartered Gas Company, and have been acquainted with gas-works all my life. I have heard what has been stated in reference to the plaintiff's invention, and I agree in what Mr. Barlow has said about it, and also as to the description and drawing in Clegg's book.

Cross-examined by Mr. GROVE: I do not think that the plates ordinarily used in the construction of gasholders could be bent into a cup shape practically.

Re-examined by Mr. BOVILL: Looking at the drawing in Clegg's book, and with my knowledge at the time, I should have made the cup there represented of two pieces of angle iron. The difficulty connected with the bending the iron, when curved, would be that you would have to lengthen the outer circumference of the plates.

Mr. *Joshua Horton*, examined by Mr. BOVILL.

I am the plaintiff in this case. I have been twenty years in business as a manufacturer of gasholders. Before the date of my invention I had never heard of the cups of telescope gasholders having been made in any other way than with two-angle irons. I invented my plan in 1850, and the first gasholder in accordance with it was put up in February or March, 1851, at Dublin. The different parts of that holder were manufactured at my works, and sent in separate pieces to Dublin. The first portion left on the 29th of November, 1850. I had no arrangement to put up a gasholder, with my improvements attached, down to the time when this holder was made. I had never even put up one at my own works, for experiment or otherwise. There were some objections raised by the company when it was first put up, which I obviated. Since that time, I have adopted that plan of making gasholders, and have found it answer.

Cross-examined by Mr. GROVE: The complaints made by the company at Dublin had no reference to the mode of constructing the hydraulic cups, but to the guide-columns, which were not put upright. The materials for the gasholder arrived there in December, 1850. They were sent in lengths ready to be rivetted together. The contract was to have been completed by the 18th of December, but the time was subsequently enlarged. On the 2nd of November, I was paid £20. That was not on account of the gasholder, but the tank, which was part of the contract. I had a correspondence with the defendant about my patent in 1851 or 1852. My specification and his registration were within a few days of each other. I heard of his having registered his design sometime afterwards, and, thereupon, I wrote to him, and I instructed my solicitor to take proceedings against him. I had an interview with Mr. Levick at the defendant's office in February, 1852. I have no recollection of having seen the defendant then. He was making some castings for me, and I called about them. I do not remember whether I then saw Featherstone, the defendant's foreman. I cannot swear that I did not see Mr. Mabon. Clegg's book was shown to me, for the first time, on that occasion. I did not then say that both our inventions were good for nothing, nor anything to that effect. Neither of us said so. I do not remember whether we were discussing the question of the infringement of my patent. It is possible something may have been said about it when the book was introduced by the defendant's clerk. I did not say, upon seeing it, that there was an end of the matter. From that time, until 1860, there were no steps taken by me against the defendant, for I did not know that he continued to infringe my patent. I did not inquire whether he did or not, and I had not the slightest idea he was doing so, as he had notice to discontinue it. The first gasholder which I saw of the defendant's manufacture on my principle was in 1860, when I brought this action.

Mr. GROVE said he did not intend to give his learned friend any trouble to prove the infringement. It might be taken that the defendant had used double-angle iron for the manufacture of these cups.

Mr. BOVILL said he was quite prepared to take it in this way—that the defendant made them according to his registered design.

Mr. GROVE said he could not admit that.

Lord Chief Justice ERLE: He has made some according to it?

Mr. GROVE: No, my lord; I do not think he has.

Lord Chief Justice ERLE: If that model represents what he has made, I do not see any substantial difference.

This closed the plaintiff's case.

Mr. GROVE, for the defendant, submitted that, upon the case as it stood, there was nothing to go to the jury. In the first place, the evidence did not show that the invention was the subject matter of a patent. It was admitted that the so-called double-angle iron was, before the date of the patent, a well-known article of manufacture used for a variety of purposes, though not in gasholders. There was no claim in the specification for any mechanical detail of construction, nor, indeed, was it shown how the thing was to be made. Whether easy or difficult of application, the plaintiff's patent did not in any way solve. What the plaintiff appeared to claim, as far as he (Mr. Grove) had read the specification, was the application of what he termed a bent plate, which, on the evidence, it was clear was substantially the same thing as double-angle iron. He could see no difference in it, except that the corners of the plaintiff's cups were a little more rounded, and in which respect they did not correspond with his drawing. He apprehended that this was not the subject of a patent. It was said by one of the witnesses that the plaintiff's invention would not apply to anything else except a gasholder trough, and, therefore, he could not prevent the use of a curved rim for any other purpose to which such a thing was applicable. The plaintiff only applied that which was already well known to a cognate use.

Lord Chief Justice ERLE asked, whether all the facts for raising this point were not undisputed?

Mr. GROVE said, several of them were subject to certain questions of practicability.

Lord Chief Justice ERLE said, as to the new use of an old invention, there were undisputed materials for moving the court that the patent could not be sustained.

Mr. GROVE said, the second point which arose was, that on the evidence as it stood there was proof that before the plaintiff took out his patent he had manufactured these things; and, also, though that perhaps was a separate head, that it had been used for profit, because the plaintiff admitted a payment of £20.

Lord Chief Justice ERLE said, the plaintiff alleged that what he had done before was only experimental: but he would reserve the point. [The plaintiff was recalled, and, in answer to the learned judge, said, some of the plates were fitted together before leaving his premises to verify the work, but the gasholder was not entirely constructed. The hydraulic cup was fitted, but not rivetted. Some of the parts of the holder which were rivetted were shipped in that condition.]

Mr. GROVE said, the next point was that upon the face of Clegg's book, without importing extraneous opinions, the invention had been previously made known to the public.

Lord Chief Justice ERLE said, that was a point within his determination, and he was of a different opinion to the learned counsel.

Mr. GROVE then addressed the jury. He began by saying, that, according to his experience, the advantage which a plaintiff had of first calling his witnesses was considerably increased in all cases where patent rights were concerned. Such inquiries as the present, generally speaking, referred to matters respecting which learned judges and gentlemen composing juries were not so conversant as with those questions of law and commercial matters which came before the courts for adjudication. There were very few patent trials in which, so to speak, the aspect of the case did not change in colour and form from the various points of view in which it was presented, and when gentlemen had sat for several hours listening to ingenious witnesses who had studied the whole matter, who knew the issues to be tried, and whose minds had been moulded to a particular form in reference to them, the jury were not exactly in that condition which, however desirous they might be to act impartially, enabled them to balance equitably the whole bearings of the case. It was true the defendant, through his counsel, had, in his turn, the opportunity of calling witnesses in support of his position, but these witnesses had, first of all, to undo the effect of the plaintiff's evidence, before the minds of the jury were ready to receive his version as upon a *tabula rasa*, and as they would probably have regarded it had his case first come before them. With these remarks, he asked them to endeavour to look at the matter without allowing any preconceived notions to have undue weight, and to come to an impartial judgment between the parties. They were not called upon, in this inquiry, to judge whether the invention of the plaintiff was useful or not. There was no issue upon the record to that effect, and the allusion which had been made to the saving which it would effect was an attempt to prejudice their minds, and lead them away from the main question in dispute. What they had to decide was, whether the plaintiff's invention could fairly be looked upon as a new one. There was a question of infringement, but, in one sense, that would not arise. It was rather a question of law than of fact; for, if the plaintiff claimed the bending up of a piece of iron into a cup shape, which was what he described in his specification, the defendant had not infringed his invention. If, on the other hand, the patent comprehended angle iron, then the defendant had infringed it.

Lord Chief Justice ERLE said, the patent was for a form closely analogous to angle iron, but curved, and applied to gasholders. The angle iron which was known was always in a straight line.

Mr. GROVE said, there was no claim for the curve.

Lord Chief Justice ERLE said, the chief part of the invention, as far as he could see was the curve, and it was claimed by implication.

Mr. GROVE submitted that the plaintiff made no pretence in his specification to having overcome any mechanical difficulty in curving the plates, but to getting rid of the extra sets of rivets. Practically speaking, the curving in a gasometer of large diameter was very small, and there was nothing in the specification which confined the invention to a circular gasholder; so that, if his claim held good, no person could make one of a square or polygonal form, having cups of angle iron, without coming within his patent. If he was right in the view he took of it, the curvature had nothing to do with it; it was not of the essence of the patent. The plaintiff did not say that, whereas difficulties had existed in making curved plates of iron, he was enabled, by his invention, to overcome them by rolling them hot, or by casting them; but he claimed the one piece of iron bent up into a cup shape, instead of two, however made. What he considered of value was, the construction of hydraulic cups or joints of gasholders, in which the top or bottom of such cups or joints was formed of plates of iron, made or bent into a cup shape, so as to admit of the valve being made complete, and attached to the gasholder without the necessity of employing angle iron and double sets of rivets. What was the real state of invention at the time? Angle iron was known, and the cups of gasholders were made of it; and, for aught he knew, many persons might still prefer to make them so. The plaintiff proposed to make them of one piece; the question was, was that new at the date of the patent? It was for the court to say whether the appliation of a known thing—angle iron—to a particular purpose was the subject of a patent; but, as to the amount of invention in it, there did not appear to be any. It might be an advantageous and economical application, but something more was required to support a patent right. Were they to be told that, though they could go into the market and buy angle iron in any quantity, there was one particular use to which they must not apply it, viz.—that it must not be rivetted to a gasholder. The defendant, before the date of the plaintiff's specification, had made this very angle iron, but he had not put it up in any way which constituted a publication, because he intended to register it himself. When he discovered Clegg's book, he saw at once that his registration was not worth a fig; and, when, after the plaintiff had written letter after letter to him, he told him, at an interview which they had, what were his impressions upon the subject, and the plaintiff agreed with him. [The learned counsel proceeded to read and comment upon the correspondence which passed between the parties in 1851, which he contended showed that the plaintiff's statements were inconsistent.] The evidence for the defence would show that, at the subsequent interview the plaintiff, being shown Clegg's book, admitted that his invention had been previously published to the world, and that his patent was valueless. He did not mean to assert that the plaintiff was bound in law by that admission; he had a perfect right to retract it, but the importance of the evidence was, that it showed what two men interested against the book, and both more or less conversant with the construction and arrangement of gas-works, thought of the disclosure which it made, and that he (Mr. Grove) considered was worth a world of scientific evidence after the parties were at issue. It appeared, looking at the drawing referred to in the text of the book, that the author must either mean a cup of double-angle iron rivetted on (though the rivets were not shown) to the return-plate of the gasholder, or it must mean the latter plate turned up and a piece of double-angle iron put within to strengthen it.

Lord Chief Justice ERLE could not see how, if the writer meant the returned rim of the gasholder-plate, it could be called angle iron. The inven-

tion of the plaintiff consisted in getting rid of one angle iron and a double set of rivets; and, if a man had learned Clegg's Treatise by heart, he never would have conceived that it was intended here to show how the trough could be completed with two rows of rivets, instead of four. If the learned counsel thought that Clegg showed the same thing as the plaintiff, he had a perfect right to tell the jury so, but he (the learned Judge) confessed that he could not see it.

Mr. GROVE said, he was going to tender the evidence of two persons interested the reverse way who thought it was there. He would also call scientific men, who would say that it brought to their mind the same thing. The point he wished to submit to the jury was, that the drawing in Clegg showed a piece of iron bent exactly in the same form.

Lord Chief Justice ERLE: Let it be so. I cannot conceive of any hydraulic joint that would not be comprised within Clegg's description, and the plaintiff's is an improvement upon a former one. I think Clegg meant the lower plate of the gasholder to be turned up to form the trough, because he calls it a return-rim.

Mr. GROVE: Would not that be within the plaintiff's claim?

Lord Chief Justice ERLE: He puts it most distinctly that it is not the return-rim, because he says—"I form my cup of plates of iron made or bent into a cup shape, and that is to be rivetted on one side to the lower plate of the gasholder, by which a considerable saving is effected."

Mr. GROVE said, he had no doubt contemplated making it in a separate piece, but the same object would be attained whether he did or not—viz., the saving of a row of rivets. And, as he claimed "any other mere modification" of the mode of construction, it was evident that he included every improvement which could be made upon the plan he showed, and that whoever invented a better way of attaining the same object would be said in law to infringe his. But Clegg's drawing did not stop here, for it showed what he could not help calling a piece of angle iron. The gasholder represented was a small one, the plates of which would be thin, and probably not strong enough. He therefore appeared to have strengthened them by adding a piece of angle iron, by which means he got the very cup shape in the interior, and avoided the use of rivets which the plaintiff claimed as part of his invention, and it was well known that to infringe any part of a patent was to infringe the whole. There was also another point; the dimensions of this gasholder cup, 12 inches deep and 3 inches wide from the side, rendered it perhaps not physically impossible, but certainly impracticable, to employ rivets in the formation of the bottom. Assuming the lower plates of the gasholder to be turned up to form the hydraulic cup, it was not necessary to conclude that this was done after they were put together in a circular or polygonal form; the edge of each plate would be returned when separate, and, though this might cost more than using angle iron, it would not be more expensive than bending iron into a straight edge, as described by the plaintiff. He felt that the jury would be obliged, looking at the whole case, to say that Clegg had anticipated the plaintiff, and that his invention was not new at the date of his patent.

Mr. *Walter Mabon*, examined by HINDMARCH.

I am the defendant in this action, and have carried on business at Manchester as a maker of gasholders for the last twenty years. In July, 1851, I registered a particular form of gasholder cup, which I was not aware had been used before. I had not then seen Clegg's Treatise. In the autumn of that year, I received some letters from the plaintiff and his attorney, charging me with an infringement of his patent. After I received them, my foreman and I searched all the books we could get, and found the same invention in Clegg. The plaintiff subsequently called on me, and I told him his patent was not worth a fig; and, when I called his attention to Clegg's book, he said it (the drawing) was like it, and afterwards, to the best of my recollection, "this is the same as mine." I do not recollect whether anything else passed. I have continued to make gasholders in the same way up to the present time. I have done business with Mr. Horton under two different contracts since, and he has never mentioned the matter again. I have adopted the same mode of constructing the cups from 1851 down to 1860, when these proceedings were taken. In making the cups, I have employed the double-angle iron of commerce, which is a well-known material applied to a vast variety of purposes. When I saw Clegg's book, I found that it disclosed the same thing that I had registered, and I, therefore, abandoned my claim.

Cross-examined by Mr. BOVILL: My invention is not the same thing as the plaintiff's; quite different.

Lord Chief Justice ERLE: Is it so? I thought the plaintiff's was very much like.

Mr. GROVE: That depends upon the sense in which you read his specification.

Lord Chief Justice ERLE: I know it is so. And is it not of the essence of this inquiry to know what the invention is?

Mr. GROVE: Undoubtedly.

Lord Chief Justice ERLE: I thought it was a trough capable of being fixed with rivets to the gasholder on the one side, and to the plates on the other.

Cross-examination continued: I never told the plaintiff that I continued to make these cups on that plan. Since 1851, I have also made them on the old plan, with two angle irons; I cannot say how many. After the gasholder is put up, any one can tell how the cups are formed, without taking it to pieces.

Re-examined by Mr. GROVE: I consider my plan is different to the plaintiff's, because his cups are made of sheet iron, and mine of rolled iron. We get it shaped in any way we please. We can get curved angle iron.

Mr. GROVE: The defendant's is rolled in the angle, and, as I understand it, the plaintiff's is bent at the outer edge.

Lord Chief Justice ERLE: Is the common double-angle iron of commerce rolled iron? It was suggested it might be cast. You do not use it cast?

Witness: I do not.

Lord Chief Justice ERLE: In making your gasholders, you use rolled iron?

Witness: Yes; rolled flat, and bent up afterwards.

Mr. BOVILL: Will your lordship ask him, whether he has ever seen the double-angle iron rolled in a curve?

Witness: No; I have never seen it rolled in a curve; it is bent after it is rolled.

Mr. *James Featherstone*, the defendant's foreman, proved the conversation which took place between the parties at the interview in 1851.

Mr. *Edward A. Cowper*, examined by Mr. GROVE.

I am a civil engineer. I am acquainted with the construction of gasholders, and am familiar with double-angle iron, which I have used in many cases, long before the date of the plaintiff's patent. It was used for a variety of purposes—very commonly for roofing. I have used it curved. When it comes through the rollers red hot, it is laid down upon a curved block of iron and hammered, which is the most economical mode of curving it. There would be no substantial difficulty in curving it, if the side were prolonged to 12 inches. It would require a larger furnace and a little more labour; but, it is perfectly feasible. We bend much larger pieces of iron than that. The difficulty chiefly arises from the iron having to be made larger on the outside than the inside, so that the outside has to be stretched. But the amount of curvature here is very slight. There is nothing in the plaintiff's specification which indicates that the curving is any part of his patent; the language would cover both curved and straight plates. I have read the portion of Clegg's book referred to, and the impression it made on my mind was, that there was an end of this case, because double-angle iron is shown there to all intents and purposes.

By the COURT: When Clegg says "the rim is returned," I understand him to mean double-angle iron.

By Mr. GROVE: It is quite impossible that he could mean a separate piece of angle iron; there is not room enough for one thing; it is only 3 inches wide, and you could not get two pieces of angle iron in the space; there would be no strength in it. The drawing directly contradicts the idea, for the bottom is shown in one piece, and I believe that a practical man, looking at the dimensions, would see that he could not rivet, and would inquire for double-angle iron.

Cross-examined by Mr. BOVILL: I have had Clegg's book in my possession for ten years; but, my particular attention was only called to the matter in reference to this case. I have been intimate with the construction of gasholders for fifteen years. During the whole of that time, I have never seen any made like the plaintiff's. Up to the date of his patent, I had never seen any except with two angle irons. Clegg's book professes to be a description of the action of the water-joint. The drawing shows neither plates nor rivets.

Mr. BOVILL: Supposing he had intended to show the old plan of two angle irons at the bottom, he might still, for the purpose of a water-joint, have had a continuous line of drawing?

Witness: I think that is an error.

Mr. BOVILL: That is just what our witnesses say—that it is an error of a man who knew nothing about it.

Lord Chief Justice ERLE: Supposing the bottom of the cup was intende to be of two angle irons, would it be any different?

Witness: It is quite inconsistent, because he gives the dimensions.

Lord Chief Justice ERLE: But those dimensions have reference to the principle of the construction of the water-joint. Is there anything that would make you say he had not in his mind two angle irons, except the size?

Witness: Independently of the size, there are the two sides. It would have been two angle irons of different sizes.

Mr. BOVILL: Take it as it is shown there, would it show the cup formed by the continuation of the holder-plates passing down and forming the bottom and dip-side of the cup?

Witness: Yes; it is shown so.

Mr. BOVILL: That being so, if that drawing means anything, does it not mean that, in addition to the cup formed by the continuation of the plate, there is what is called a double-angle iron put in?

Witness: I say, no; because I use my common knowledge in reading the book.

Cross-examination continued: I think it shows a double-angle iron at top and bottom. It does not show any rivets. It might be that the rivets were passed through the additional piece to fasten it to the bottom; but it is much more likely to be rivetted through the side. I have not said anything about rolling a double cup. It would be possible to roll a double cast-iron 12-inch dip, but it would be more expensive. With the side-plate, I think I may say it would be impracticable.

Re-examined by Mr. GROVE: I do not think any question was raised about rolling it in this form—it was bending, and that could be done easily. They are still made in the old form. I do not think they make so good a job as the double-angle iron, because the upper part of the gasholder may come upon the rivet-edge.

Mr. *Frederick J. Bramwell*, examined by Mr. LUSH.

I am a civil engineer. I have known double-angle iron as an article of commerce for many years. There is no difficulty in making it into a curved form. I have read the description in Clegg's book. The phrase, "returned to form the cup," is not a technical phrase, but a common one, and imports that there is to be another side parallel to the gasholder-plate, and not that the plate itself should be turned. As a practical man, I should say that it would be formed by the plate of the gasholder being rivetted to a double-angle iron, which, in its turn, is rivetted to the outer or return-plate. There is nothing new in that. I agree in the evidence given by Mr. Cowper.

Cross-examined by Mr. BOVILL: Taking the description in the book, there would be a double-angle iron, and another piece of iron going completely round it; there would be one cup within another all the way round.

Re-examined by Mr. GROVE: That would be rivetted, if done for strength, to the side. I cannot conceive of its being put there at all; still, it would effect the purpose of the plaintiff by dispensing with the bottom rivets. You would also have a bent plate of iron, so that substantially it would be the same thing as his invention. It is not impossible, if the angle iron was there for the purpose of strength, that a man might rivet it to the sides. But I think the double-angle iron would not be put in at all with the bottom plate—I mean taking it on the supposition that you had a cup made by bending the plates of the gasholder. As the drawing actually is, the double-angle iron is put within a plate turned round. Taking the description, I should direct the workmen to buy a double-angle iron 3 inches wide, and rivet it to the gasholder.

Mr. GROVE summed up the evidence for the defence, and urged that the description in Clegg's Treatise was an anticipation of the plaintiff's patent by showing a mode of effecting the same object by substantially the same means—viz., a bent plate. It had been proved, too, that double-angle iron, whether straight or curved, was an old article of commerce in use for a variety of purposes; and it was absurd to assert that a workman of ordinary intelligence, familiar with this article, and having Clegg's book before him, should be prohibited from applying it to the cups of gasholders, because the plaintiff claimed under a patent, the known infringement of which, admitting it to be valid, he had allowed for eight years to go unchallenged.

Mr. BOVILL replied on the whole case. Whatever might be said of a previous publication by Clegg, it was admitted on both sides that his drawing represented a cup formed by a continuation of the boiler-plate with an additional something which, by the defendant's witnesses, was called double-angle iron, but which it was equally admitted was perfectly useless, and the practicability of adopting which was doubtful. That it was no disclosure of the plaintiff's invention was evident from the fact that, until he took out his patent, no one had been been able to make the hydraulic cup, except with two angle irons and four sets of rivets. In registering exactly the same design very shortly afterwards, the defendant said—"In making the cup and dip of gasholders, it has heretofore been customary to use, instead of the

double-angled iron above described, segments of sheet iron, to which two common angle irons were rivetted." It was thus proved that up to that time he believed the invention had not been discovered. The plaintiff's invention in substance consisted in getting rid of four rows of rivets.

Lord Chief Justice ERLE said, there was no such thing as a patent for getting rid of an expensive construction. As he understood the plaintiff's claim, it was the formation of a cup as represented in the drawings, and which was substantially the same as that which the defendant registered, viz., double-angle iron. If he had claimed to have invented double-angle iron, his claim would have been bad, because it was known before. His witnesses said, that the invention was the use of double-angle iron in a curved form, which was not known before, but, Mr. Cowper said there was no difficulty in curving it. The question came to this, whether the new application of double-angle iron constituted the subject of a patent? If it required some special modification to make it applicable to gasholders, that certainly would be new. He thought the jury would say that no one had used it for that purpose before the date of the plaintiff's patent, unless they were of opinion that Clegg's book disclosed such a use. He would ask the jury the question, whether they considered the application of double-angle iron for the cups of gasholders was new, and whether the form of the cups, for which the plaintiff took out his patent, was the double-angle iron known in commerce for years before? If these points were decided by them, there would be no difficulty in the way of the parties getting their rights by moving the court above.

Mr. GROVE thought the jury should be asked to say, whether they found that the double-angle iron had been in use before for a variety of purposes?

Lord Chief Justice ERLE said, he thought Mr. Cowper's evidence was undisputed, that it had been used for all manner of purposes, both curved and straight.

The jury, under the direction of his lordship, found that, as far as the application of a cup, in the shape described in the plaintiff's specification, to a gasholder is concerned, the plaintiff's invention was new at the date of his patent, and that the double-angle iron of commerce had been known for a period of years, and applied to a variety of purposes in a curved form, as well as in a straight line.

Mr. GROVE asked to have the verdict entered for the defendant.

Lord Chief Justice ERLE said, his opinion was, that the substance of the invention was the form of the cup, and that that was only a new application of an old form.

The verdict was then entered for the defendant, with leave to the plaintiff to move on the facts; and his lordship certified for a special jury.

BRISTOL POLICE COURT.

WEDNESDAY, DEC. 18.

(*Before* J. COATES, *Esq.*, *and* R. G. BARROW, *Esq.*)

James Guy, tinplate worker, Horsefair, was charged with having unlawfully consumed gas, the property of the Bristol United Gas Company, by transferring the inlet to the outlet-pipe, and *vice versa*, thus sending the gas through the meter by an opposite way and preventing the amount consumed from being registered, whereby he had made himself liable to a penalty of £5.

Mr. A. BRITTAN appeared on behalf of the Gas Company; Mr. J. F. PRIDEAUX for the defendant.

Mr. W. NAISH, the vice-chairman of the company, who had been previously sitting as magistrate, said he would take no part in the investigation, and retired from his judicial function accordingly.

In the first instance, by the advice of his attorney, the defendant pleaded guilty, and Mr. Prideaux said he would explain to the bench how the circumstance had occurred.

Mr. *Charles Trevett*, gas inspector, proved the case, but the defendant interfered, and charged the witness with withholding part of the truth, and with stating other things that were not true.

Mr. PRIDEAUX then entered upon a lengthy explanation of the occurrence, from which it appeared that, about a fortnight ago there had been a leakage in the outlet-pipe leading from the meter to the house. The defendant's apprentices had repaired that leak, and in doing so had transferred the pipes unknown to their master, who was totally unaware of the pipes having been wrongly put into the meter. Mr. Prideaux also stated that it must be admitted by Mr. Trevett that the meter had not been in a proper state, or it would have been impossible to get a supply of gas in the manner alleged. He therefore asked for the penalty to be mitigated under those circumstances.

Mr. BARROW said, they could not mitigate the penalty; they must either dismiss the case or fine the defendant £5.

Mr. PRIDEAUX said, it was not the money which his client cared about, so much as the impression which might get abroad that he had been defrauding the company.

Mr. BRICE (magistrates clerk) said, he apprehended that it was the guilty mind which made the guilty man, and by the defendant's statement he knew nothing about it. He was sure the magistrates would allow the defendant to withdraw his plea of guilty if he could show that he was unaware of the fact of the pipes having been transferred from one to the other.

The BENCH expressed a perfect willingness to do so.

Mr. BRITTAN: But, according to Mr. Trevett's statement, the defendant acknowledged that he helped to do it.

Mr. BRICE: I think it a very indiscreet matter, to say the least of it.

Defendant: I did not tell Mr. Trevett that at all.

Mr. BRITTAN said the company believed the matter had been going on for some time; they had reason to think so from the decrease in the account, caused by the decrease in the amount burned as registered.

Mr. PRIDEAUX said he had several witnesses who would prove that the defendant knew nothing of the pipes having been shifted, and he would also call some as to character.

Mr. BRICE said the proceedings were altogether irregular; the defendant had pleaded guilty to the charge, and that made him liable to the penalty, which could not be mitigated. He would not ask what they were going to do—was he going to withdraw his plea or not?

Defendant: I cannot plead guilty to a thing I am innocent of.

Mr. BRICE: Very well, then; let the case be properly gone into.

Mr. *Trevett* was then recalled, and said: I am the inspector of the gas company of this city. In consequence of information which I received from William Masters, the meter examiner, I went to Mr. Guy's on Friday last. He had been for some years a customer of the company at No. 6, Horsefair. On going there, I saw Mr. Guy in the shop. That was about eight o'clock in the evening, and four lights were burning. The defendant burned his gas by meter, and the company's gas was attached to the main. I went downstairs, and Mr. Guy followed me. I saw him in the shop, and told him I had come to inspect the gas-fittings; and, when we got into the cellar, I pointed out to Mr. Guy that the inlet-pipe had been removed to the outlet, and that the outlet-pipe had been transferred to the inlet. I asked him what it meant, and told him that it was not right. I told him that it was very suspicious, and pointed to some white lead. I asked him when it had been done, and he stated about a week ago. I asked him who did it, and he stated that he assisted in doing it. He also mentioned, that in removing the pipes he had altered the tap for the purpose of his wife being enabled to turn it off from the shop, and a hole had been cut in the floor for that purpose. I said, "That hole has been cut for many years," and the defendant replied that it had been cut for three years. I told him that I must remove the whole of it, and report it to the secretary of the company, which I did. The meter is in the same position that it was when I removed it. The joints can be removed with the fingers.

Cross-examined: The defendant did not prevent me going down stairs. He appeared to be very much surprised, and I did not give him the chance of going down before me. I can swear that the meter has been tampered with, or it would not have been possible for the gas to go through after the pipes had been removed. None of the meters sent out by the company will allow the gas to go backwards. I am sure he did not mention any of his lads names. He did not say his lads must have done it. He told me that he was as innocent as a babe.

By Mr. COATES: No one but a person well acquainted with gas-meters could tamper with it in that way.

William Masters, meter inspector, said: On Friday morning, I went to the defendant's to get a little funnel made. I looked at the meter, and saw that it was not right; and, when I saw Mr. Trevett, I reported it to him. I have heard what Mr. Trevett has said. I went first into the cellar, and was followed by Mr. Trevett and the defendant. The latter said he helped to do what had been done to the pipe. I think there was something said about a number of boys or apprentices being about. I am quite sure he said he had helped to do it.

Cross-examined: I did not hear the defendant say that he was innocent. This was the case for the plaintiffs.

James Gray Bird was then called by the defendant. He said: About a fortnight ago, one of the pipes required repairing, and we shifted the outlet-pipe. In order to do so, we unscrewed both pipes. We were obliged to do so; and, having repaired it, we screwed them on again. I was not aware that they were put on wrong at that time. I did not bend the inlet-pipe. We shifted the main-tap, in order that Mrs. Guy might be able to turn it on. The defendant knew nothing about us altering the pipes.

By Mr. COATES: I am not a gas-fitter, and know nothing about the trade myself.

By Mr. BRITTAN: When we repaired the pipe, it was five o'clock in the evening. The shop was dark, but Mr. Guy said nothing about it.

By Mr. COATES: I do not know which is the outlet and which is the inlet-pipe. I can solder a pipe. I was assisted by one of the boys.

George John Stone said, I have been three years an apprentice with the defendant. About a fortnight ago, the pipe needed repairing, and I screwed the "unions" on. We could not get any light till it was repaired. The defendant did not give us any instructions to repair the pipe. The outlet-pipe was leaking.

Mr. COATES said, the bench did not think it necessary to call any more witnesses. The case had not been the least altered, and they therefore fined the defendant £5.

Mr. BRITTAN said, in the second case, which was for allowing the gas to be so consumed, he asked for the full penalty, which was 40s. for one day.

Mr. PRIDEAUX said, it was no use opposing the application.

The bench then fined defendant the other 40s., making £7 in all, and ordered a distraint to be made in default.

The defendant paid the money at once, and in doing so said he considered he had been robbed of it.

Mr. BARROW: Do not say that; I do not think your attorney would advise you to make use of that language.

Mr. PRIDEAUX: Certainly not.

Defendant: I think I have been robbed of that money.

Mr. BARROW and Mr. COATES both said it was a very bad case, and the defendant had been very properly convicted.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

CITY COURT OF SEWERS, GUILDHALL, TUESDAY, DECEMBER 17.

At the Weekly Meeting of the Court—Deputy HARRISON in the chair—

Mr. WALTER presented a petition from the ward of Farringdon Without upon the gas question, and moved that it be referred to the special committee.

Deputy OBBARD seconded the motion.

Dr. ROSS said, as this was a petition from his own ward, he thought it his duty to say a few words upon the subject. The commission were aware that upon this very interesting topic he had as yet taken no part in their recent discussions. He knew very well that if he merely wished to gain popular applause, the most effectual way would be, with uplifted arm and a look of terror, to denounce the scandalous conduct of the gas companies. But he thought in that court they should endeavour to look upon all public questions with justice and equanimity, and that they would be more likely to attain reasonable results by so doing than by discussing them with acrimony and violence. In the course of recent debates upon the gas question, Alderman Dakin had been charged, with considerable vigour of thought and expression, with breaches of faith arising out of his connexion with the Great Central Company. He (Dr. Ross) could not echo the sentiment thus expressed. He felt no sympathy with those who made charges against individual members of the court, believing as he did that they were all honourable men, and that the worthy alderman had for many years worked heartily in the interests of his fellow-citizens in every office he had held in the corporation, whether as commissioner, as deputy, or as alderman. He was a man of enlightened mind and liberal sentiments, and, according to his ability and influence, which were great, he had devoted himself to the welfare and advantage of the community. With such feelings towards the alderman, he was prepared to assume that, in whatever he had done, he had not been wilfully guilty of breaches of faith, or a neglect of obligations. If he had done wrong in this matter, it was from a misapprehension of his duty to his fellow-citizens, or to the company of which he was the chairman. It was said that the Great Central Company, in their original petition, promised that the price of gas should never exceed 4s. per 1000 feet. No doubt these were the words of the petition, and no doubt also they were grammatically strong. But then, on the other hand, it must be remembered that, in making that statement,

Alderman Dakin and his friends expected that they were to derive a fair and liberal return for the money they had invested in this great undertaking. He (Dr. Ross) was not stating this in defence of the private character of the alderman, which probably many members of the commission would agree with him required no defence, but in order that the question might fairly be put before the court. The words of the clause immediately preceding that in which the price was spoken of were these—"The directors of this company are for the most part large consumers in the City, and are connected with it by commercial or corporate ties; they desire that the advantages to be derived by the citizens from their efforts shall be rendered permanent; they, therefore, intend to obtain an Act of Parliament during the approaching session, to give the usual facilities conferred by the Model Gas Act always granted by Parliament, but more particularly to bind themselves, and their successors, to supply at all times, the best possible gas at the lowest possible price, after paying to the shareholders a fair and liberal return for their capital employed in the undertaking." He (Dr. Ross) was not a member of the commission when this petition was presented; and, until he saw it in print, he had been inclined to take the one-sided view which had often been taken in that court as exhibiting the real state of this question. But it was clear that the original promoters intended, and expressed in so many words, their intention to give the citizens gas at 4s. per 1000, on the condition that they should get what they believed that price would give them, "a fair and liberal return for their capital employed in the undertaking." And what did they consider a fair and liberal return? The third provision which they proposed to incorporate in their Act supplied the answer: "That the price of gas to the consumer shall never exceed 4s. per 1000 cubic feet, and that the price shall be from time to time reduced as consumption increases, so that all excess of profits beyond 10 per cent. shall be always applied in reduction of price to the consumer." This was more than implying, it was indicating clearly enough that they expected to get 10 per cent.; and if, as the result of their operations, they had not done so, surely, in equity, as between man and man, and as between a public body and a public company, they had a right to expect that, at some future day, there should be a reconsideration of their agreement. The word "never" was a very wide word. Did it mean to all eternity, to the day of judgment, for a thousand years, for a generation? Or, was it the parliamentary word "never," which meant, that what was agreed to one session, might be repealed the next? It was certainly not intended to bear the wide construction which was sought to be put upon it by those who were now condemning the conduct of the company. It was a mere conventional term, a colloquial term, inserted very improperly, as he thought, because it might be construed—as indeed it had been—to bind the company until the day of doom. So much he had thought it proper to say, because he considered the dignity of the commission depended upon the character and integrity of its members; and he had always endeavoured, in the fulfilment of his public duty, to regard the conduct of his fellow-men as above suspicion and without a stain, until the evidence against them was too strong to admit of a doubt of their motives and proceedings. He reminded the court that the Metropolis Gas Act, which had given rise to the present agitation, was not an Act obtained by the Great Central Company. It was an Act obtained by certain persons who worked upon the fears and selfishness of the promoters of the bill, who consented to its alteration to its present form that they might be relieved from the pecuniary responsibilities in which they had involved themselves. He admitted that the Act oppressed the citizens most unjustly in many particulars. It was unfair that the gas companies should have the power, either by an appeal to the Secretary of State or in any other way, to raise the price of gas from 4s. 6d. to 5s. 6d., and even to 7s. 6d. by using cannel coal. This was a most unjust provision, and was one of the details of the Act which ought to be repealed. He thought also that the power to charge a meter rent was unjust. All these questions were fairly open to discussion, but he desired to relieve the Great Central Company from the obloquy of having promoted a bill containing these obnoxious clauses. The bill was a bad bill, and ought to be modified. With regard to the present agitation, he very much wished to see it bear larger fruits than it appeared likely that it would do. If the result of it was only to obtain a reduction in the price of gas of 4d. per 1000, it was hardly worth the labour bestowed upon it. He was not prepared at the present moment to assert that the Court of Sewers should become manufacturers of gas, although, if the citizens of London desired it, they might probably find it a profitable speculation. But he would advise the commission not to attempt to realize a profit out of the supply of gas or water to pay for public improvements. It would be a most dangerous thing for them to meet the expenses of public improvements out of a gas-rate over which they could have no control. Let them meet all such matters by levying a direct improvement-rate, the expenditure as well as the raising of which they would be able properly to control. In this respect, he would say "let every beast bear his own burden." But there was one suggestion which, at the present moment, appeared to him worthy of consideration. Complaints were constantly made about the blocking up of the public thoroughfares, in consequence of gas and water companies laying down their pipes, and claiming in doing so the right to break up the streets whenever they pleased. In his opinion, this commission should have the most perfect and absolute control of the public ways, both above and beneath; and, they would never be able to exercise that until they obtained possession of the pipes which were laid under the pavements. The petition of the Great Central Company, to which reference had been made, stated that the City and Chartered Gas Companies were permitted many years since, under a contract with this court, to lay down their pipes throughout the City, with a distinct written agreement that, at the expiration of the contract, the court should be entitled at their own pleasure to purchase the pipes of the two companies by valuation. It then went on to state that Mr. Pearson had suggested that it might be expedient for the commissioners or the corporation to buy up the old company's pipes at a valuation, at the expiration of the then pending contracts, according to the terms of the original agreement for laying them down, and to purchase wholesale, of a Consumers or some other company, superior gas at a price which would enable them to retail it to the citizens at 4s., and thus obtain a large annual surplus, after repaying interest on capital, to be applicable to sanitary or other public improvements within the City. This appeared to him (Dr. Ross) to be the wisest course they could take—to keep the power of distributing gas in their own hands. So long as they had private companies, or *quasi* private companies, with the sole power of manufacturing and supplying gas, so long would there be ways found to keep up the price, and so long would the difficulty to which he had adverted, about the breaking up of the public thoroughfares, be unavoidable. Unless the result of the present agitation should be to give the commissioners this absolute control over the streets of the City, he could not regard it as so permanently and practically useful as it might be.

Dr. ABRAHAM, in a long address, defended the course he had taken in this matter, and disclaimed any personal hostility to Alderman Dakin. The suggestion which Dr Ross had thrown out, as to the commissioners purchasing the pipes of the company, might have been usefully entertained some fifteen or twenty years ago; but, the companies had precluded the possibility of such an arrangement now taking place, by inserting clauses in their respective Acts, by which they cancelled the powers which the commissioners had previously reserved in this respect.

After a few remarks from Deputy JONES, the motion was put and carried.

CONTRACTS FOR THE PUBLIC LAMPS.

The court proceeded to receive tenders for lighting the public lamps for one year, from February 1, 1862.

The City of London Company tendered for the supply of batswing burners, consuming five feet per hour, at £5. 5s. each, or three feet per hour, £3. 11s. each, the gas to be of the quality prescribed by the Metropolis Gas Act. The directors stated that they were aware their tender was not in conformity with the specification of the engineer to the commission, and they expressed their regret that, after a careful consideration, they felt they could not, with a due regard to the interests of the company, accept that specification as the basis of a contract, without considerable modifications. They referred, however, with confidence, to the way in which, for a period of thirty years, they had lighted the public lamps of the City, as a proof that any contract they might enter into would be honourably and satisfactorily performed. The additional price at which they had now tendered was rendered necessary by the increased obligations laid upon them by the Act of Parliament, and the necessary expense of transferring the services of the public lamps, should their tender be accepted.

The Chartered Gas Company forwarded a copy of a letter which they had addressed to the various vestries and district boards with whom they had lighting contracts, giving them the choice of different qualities and quantities of gas, with varying corresponding prices. The directors stated that, as they

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1	3 5 0	2 10 0	2 12 6	3 0 0	3 5 0
1½ and 2-inch Socket-pipes	7 0 0	6 0 0	6 5 0	6 10 0	6 15 0
2½ and 3-inch ditto	6 10 0	5 10 0	5 15 0	6 0 0	6 5 0
5 and 5-inch ditto	6 0 0	5 0 0	5 5 0	5 10 0	5 15 0
6 inches and upwards ditto	5 15 0	4 15 0	5 0 0	5 0 0	5 10 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 15 0	5 0 0	5 5 0
Ditto, 2nd ditto, cold ditto	6 10 0	5 5 0	5 10 0	6 0 0	6 5 0
Tank-plates, ¼ thick and above	6 0 0	5 0 0	5 5 0	5 10 0	5 10 0

WROUGHT-IRON TUBING,

Subject to 40 *per cent. Discount.*

	2 in.	1½ in.	1¼ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 12 feet—per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto ditto, from 6 inches to 18 inches—each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting-pieces, or Long Screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, Springs, and Elbows (wrought iron)	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, ditto	4 6	3 0	2 6	2 0	1 6	1 2
Iron Cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

COALS.—*Per Ton.*

Newcastle.—Unscreened.	6s. 9d.	*Scotch Cannel.*	45s. 0d.
Whitwell Primrose		Boghead (at Leith)	
Medomsley, Eighton Moor, and Burnhope	7 0	Kirkness, best	23 0
Pelaw	7 3	Capeldrae, 1st quality	20 0
New Pelton, Pearcth, South Pelaw, Washington Hutton, and South Pearcth	7 6	Ditto, 2nd ditto	12 6
Pelton	7 9	Lesmahago (at Glasgow)	25 0
Ramsay's Newcastle Cannel	16 0	Ditto (at Leith)	27 6
		Arniston	27 6
		Wemyss	20 0
		Knightswood	18 0
		Pirnie	14 0

FREIGHTS.

Coastwise—Newcastle.—Per Ton.	7s. 0d.	*Foreign.—Per Keel.*	£26 10s.
Chatham and Rochester		Barcelona	
Cork	11 6	Bordeaux	18 0
Dover and Folkestone	7 6	Boulogne and Calais	9 5
Dublin	11 9	Cadiz	18 0
Exeter Quay	9 8	Cronstadt	—
Ipswich	6 6	Copenhagen	10 15
London (Pool)	7 0	Genoa	23 0
Lowestoft and Yarmouth	6 6	Hamburg	—
Lynn	6 0	Havre de Grace	11 10
Portsmouth and Southampton	8 6	Leghorn	24 0
Plymouth	9 3	Lisbon	17 10
Shoreham	8 3	Rotterdam	—
Whitstable	7 3	Stettin	—
Weymouth	7 9	Trieste and Venice	£22. to 25 0

SUNDRIES.

Best Newcastle Fire-bricks—per 1000	£2. 10s. to	£2	15s. 0d.
Cliff's Fire-bricks (at Wortley)—per 1000		2	15 6
Ingham's ditto (at Wortley)—per 1000		2	15 0
Fire-clay Retorts—per foot run	5s. 6d. to	0	7 0
Tough Cake Copper—per ton		107	10 0
English Pig Lead—per ton		20	0 0
Welsh Bar Iron (in London)—per ton		6	5 0
Foreign Spelter—per ton		17	5 0
English Block Tin—per ton		120	0 0
Banca—per ton		120	0 0
Tarred Rope Yarn—per cwt.		1	6 0

were virtually under contract with the Commissioners of Sewers until June next—although the Metropolis Gas Act terminated all contracts in February—they were willing to continue the lighting of the public lamps for one year at the present charge—viz., £4. 8s. per batswing burner, and under the provisions and requirements of the Metropolis Gas Act.

The Great Central Gas Company tendered for the supply of the public lamps for one year, "at the same price and on the same conditions as are contained in the contract now expiring, but substituting the third clause in the engineer's specification of the 17th December inst., relating to the quality of the gas, for the clause of the same number in the present contract, viz.:—'The gas supplied by the company for lighting the public lamps shall be common gas, of the quality and illuminating power prescribed by the 25th section of the Metropolis Gas Act, 23rd and 24th Vict., c. 125.'"

The CHIEF CLERK inquired of Mr. Burls, the secretary of the Chartered Company, whether they were willing to accept the contract, subject to the stipulations and provisions contained in the specification?

Mr. BURLS: Certainly not.

Mr. YOUNG inquired what was the present price charged by the Great Central Company?

Mr. MASSEY (secretary) replied, £4. 10s. each lamp.

Mr. HAYWOOD: You have not given any price for burners consuming three feet per hour?

Mr. MASSEY: No.

Dr. ABRAHAM: If we use the carburating process, and require only three feet per hour, will you make any difference in the charge?

Mr. MASSEY: I have no instructions on that subject.

The parties tendering then retired, and the court proceeded to discuss the tenders, according to custom, with closed doors. After some time, Mr. Millar, the secretary of the City Gas Company, was called in, and informed that the court had adopted the following resolution:—"That the tender of the City Gas Company be accepted, on condition that they agree to the commissioners adopting the carburating process to all or any of the public lamps lighted by the company, if the commission think fit to do so."

After some conversation on the subject,

Mr. MILLAR agreed, on behalf of his company, the court accepting all risk and cost attending the process.

The tender of the Chartered Gas Company was accepted for the district at present supplied by them.

On the suggestion of the ENGINEER, it was referred to a committee to consider the question of inviting a tender from the Carburating Company, to apply their process to the lamps to be lighted by the City Company.

The special committee reported that they had prepared a bill to amend the Metropolis Gas Act, the draft of which they submitted, and asked to have the same referred back to them to prosecute, as they might be advised.

The CLERK said he had received a letter from the solicitor of Mr. Taunton, demanding payment of £250, for a year and a quarter's salary as City inspector of meters. The justices had also handed to him a similar communication which had been addressed to them.

The CHAIRMAN informed the court that the position of the matter was this—the justices had power to appoint the inspector, and the commissioners upon their orders were bound to pay the expenses incurred. This court, feeling that no public service had been rendered by Mr. Taunton during the time of his appointment, and knowing also that he was all the while in receipt of £100 a year, as inspector to the Great Central Gas Company, conferred by deputation with the justices, to see whether they could not, at any rate, be relieved of the payment of some portion of the £250 which he claimed as salary. The justices agreed not to enforce the order they had made, but they thought Mr. Taunton was entitled to some remuneration for the advice and assistance he had given them.

The communications were referred to the solicitor to the commission.

Advertisements.

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ALBION TUBE-WORKS, BIRMINGHAM,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS,
PLAIN, GALVANIZED, & ENAMELLED, for Gas, Steam, and Water, from ⅛ in. to 6 in. bore.
STOCKS TAPS, and DIES, GUN METAL GLAND-COCKS, WATER-GAUGES, &c.;
PATENT LAP-WELDED IRON TUBES,
For Locomotive and Marine Boilers, &c.
LONDON WAREHOUSE—No 66, QUEEN STREET, E.C.

SERVIER'S
PATENT
SELF-ACTING GAS GOVERNOR.
This Instrument, which is designed to replace the ordinary Governor,
Operates solely by the Action of the Gas, without any Alteration of Weights, or the Assistance of any intermediate Agency or Apparatus whatever;
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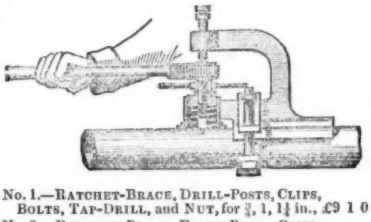

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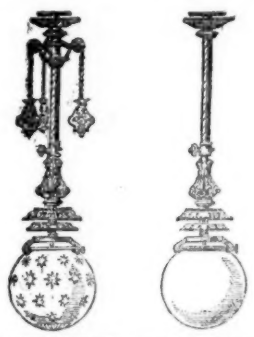

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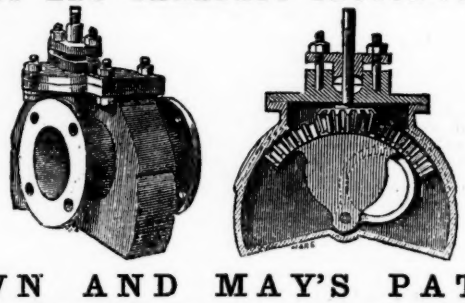

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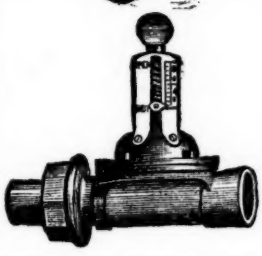

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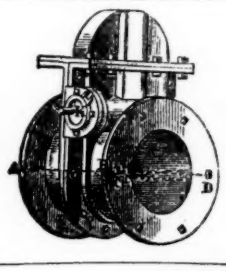

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Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.

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COKE MERCHANTS, No. 1, Walker's Buildings, SHEFFIELD, beg to inform the Directors and Managers of Gas Companies, that they are in a position to contract for the supply of the different sorts of best Gas Coal, such as best Silkstone, Barnsley, and others, at the lowest prices, which may be had on application at the above Office.

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Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, T-pieces, &c. &c.

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Every article manufactured at their own Works and Mines, Brierley Hill.

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CRUCIBLE and CEMENT CLAYS.

GARDEN EDGINGS, of various patterns.

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CLINKERS and STABLE PAVINGS, noted for hardness and durability, being perfectly non-absorbent.

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Manufacturer of every description of Fire-Bricks, Lumps, Quarries, Shields, Flue Covers, &c., to any size or shape required.

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WORTLEY FIRE-BRICK AND RETORT WORKS,

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W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all sizes kept in London at CHRISTIE & CO.—Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

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NEW PATENT HYDRAULIC GAS-METER.

BISCHOFF, BROWN, & CO.,

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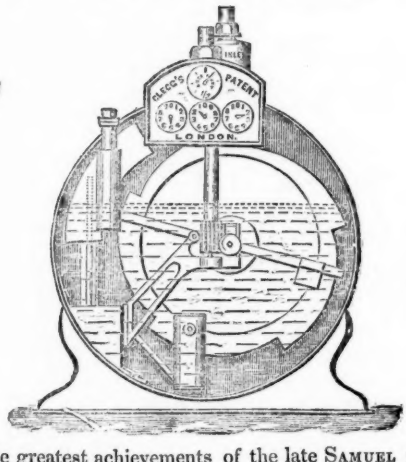
SOLE LICENSEES,



LANGHAM WORKS,

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GREAT PORTLAND STREET,

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This Meter is the last and one of the greatest achievements of the late SAMUEL CLEGG, C.E., in his connexion with the Manufacture and use of Gas, and, without presumption, it may be confidently affirmed to be the only Meter extant that can be relied upon to measure correctly, to work with the minimum of pressure, and steadiness of light. It cannot be tampered with by tilting or otherwise, and will be of great durability.

This Meter is constructed on an entirely new principle, and, when once adjusted, will always remain the same under all circumstances. The quantity or height of the water in it has no effect on its *capacity*. The immense importance and economy of this to Gas Companies who are obliged to employ so many inspectors, is so obvious, that they will be able to appreciate its advantages over all othe rWet Meters, where the varying height of the water regulates the capacity.

The Drum, from its peculiar construction, presents scarcely any resistance when moving through the water; and, its weight being taken off its axis by an air vessel, it revolves with the slightest pressure.

The comparative absence of friction in the Drum reduces the wear and tear, and enables it to be made of the strongest materials, which will keep it in working order longer than any other Meter.

It is approved and adopted by the principal London and Country Gas Companies, and is guaranteed to comply with the "Sale of Gas Act," as this Meter, beyond all doubt, works within a shorter range of registration than any other Meter manufactured.

CROSLEY & GOLDSMITH'S

PATENT SELF-ADJUSTING & COMPENSATING GAS-METERS

CANNOT BE OVER OR UNDERCHARGED WITH WATER,

and they consequently register the quantity of Gas consumed with greater accuracy than Meters in which the Water-Line is variable

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GAS-METER MANUFACTURER,

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N.B. The Patent Self-Adjusting and Compensating Apparatus may be applied to the ordinary Meter.

Manufacturer of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturer of EXPERIMENT METERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c., &c., similar to those used by Mr. King, of Liverpool.

I. BRIGGS is also prepared to supply Gas Companies and others with

DUPLICATES of Mr. KING'S CUBIC FOOT TRANSFERRER,

similar to that manufactured by Crosley & Co., and verified by the ASTRONOMER-ROYAL, and PROFESSOR MILLER, of Cambridge, on behalf of the Government, which was deposited by them in the Office of the COMPTROLLER-GENERAL of the EXCHEQUER, before Nov. 13, 1859, in compliance with the "Act for Regulating Measures used in Sales of Gas." He also supplies

TEST GASHOLDERS,

Graduated by the Standard Cubic Foot.

TRUSS'S PATENT ELASTIC PIPE-JOINT,

FOR GAS AND WATER-MAINS, AND STEAM PIPING,

Is the only PERFECT joint that has ever been constructed, and supplies the long-felt desideratum, by allowing for the expansion and contraction of metals, and for oscillation and deflection, without impairing the joint. Gas Companies will effect an incalculable saving in adopting it, as compared with the present imperfect mode of jointing.

Drawings, Estimates, and every particular, furnished on application to

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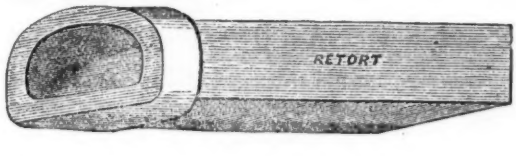
KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.



KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

FIRE-CLAY GAS RETORTS.

ESTABLISHED IN 1795.

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THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior surface.

To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

THE WORKS ARE WELL SITUATED

For EXPORT from the Ports of { LONDON, LIVERPOOL, HULL, MIDDLESBRO', HARTLEPOOL, and STOCKTON.

FIRE-BRICKS, LUMPS, GUARDS, TILES, AND CLAY OF THE SAME QUALITY.

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Manufacturers of Croll's Patent Improved

DRY GAS-METER,

Are prepared to supply their Meters duly stamped, under the authority of the Sale of Gas Act, 22nd and 23rd Vic., Cap. 66.

Fees for Stamping charged on Invoice.

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Of the best material and workmanship, carefully adjusted to meet the requirements of the SALES OF GAS ACT.

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Employed by the best experimenters in this country and on the continent, and by the Gas Testers in the London districts.

PHOTOMETERS, SPECIFIC GRAVITY APPARATUS, BI-SULPHURET OF CARBON TEST, THOMPSON'S BROMINE AND HEATING POWER OF FUEL TESTS, IMPROVED ALKALIMETER, EXPERIMENTAL METERS AND GOVERNORS, MINUTE CLOCKS, &c., &c.

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These METERS are GUARANTEED to meet all the Requirements of the SALE OF GAS ACT

GOVERNORS, STATION-METERS, PHOTOMETERS,

EXPERIMENTAL TESTING GASHOLDERS, HIGH-PRESSURE GAUGES,

AND ALL APPARATUS IN USE AT THE GAS MANUFACTORY.

D. HULETT and CO., 55 and 56, HIGH HOLBORN, LONDON,

PATENTEES and MANUFACTURERS of the ONLY GOOD MERCURIAL GAS REGULATOR,

invite the attention of Gas Companies and the Trade generally to their Improved GAS-METERS, which they warrant equal to any in Quality, Workmanship, and Simplicity of Construction, and the only Meters from which Gas cannot be obtained without being duly registered.

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GAS-STOVES, and every article connected with Gas Apparatus.

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